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AGRICULTURAL REGIONS OF NORTH AMERICA

Oliver E. Baker, *Senior Agricultural Economist*, U. S. Department of Agriculture

OUR GROWING SYSTEM OF INLAND WATERWAYS

Uthai Vincent Wilcox, *Research Economist*, Washington, D. C.

ABANDONED LAND IN A REGION OF LAND ABANDONMENT

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GEOGRAPHIC AREAS OF CITIES

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ECONOMIC ADJUSTMENTS IN LIBERIA

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THE ITALIAN HARBORS ON THE ADRIATIC SEA

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INLAND WATERWAYS

INLAND waterways are at present the subject of much attention and controversial discussion. Opinions as to whether or not they constitute an important or valuable part of a nation's system of transport seems to depend in large part upon the prejudices of the investigator, or upon the character or interpretation of the statistics available to him.

Undoubtedly rivers and other inland waterways have played an important part in the cultural development of large bodies of land with limited, or little articulated, coasts, throughout long past periods. The rise of China to early power and cultural progress depended in part upon her rivers, and they still form a most important element in her transportation system. Russia has ever depended upon her great rivers and her Black and Baltic Sea connections for her major means of transport. In the settlement and development of both North and South America, their great rivers have played a dominant rôle, and in North America the chain of Great Lakes has been of incalculable value. Australia and Africa have lagged, the latter because of the limited navigability, the former because of the absence, of large rivers.

The inland waterways of Europe have ever formed valuable arteries of travel and commerce. Since the rapid construction of her railway net, the streams and canals have continued to occupy an important, though supplementary, place in her transport and travel system. The successful use of the inland waterways of Europe has augured well for an equally successful utilization of American streams; but in North America the great reserves of available and readily accessible coal and petroleum have given the railways such an advantage that the waterways seem destined for many centuries in the future to play a minor part.

The problem of the world today is more a problem of distribution than of production. Though production of required wares and commodities appears sufficient to supply the world's needs, adequate and equable distribution has not been achieved. The possible value of the inland waterways of the world, even in the coal-rich expanses of North America, must be carefully considered in the program of more effective distribution, though railways or truck-routes may remain the major means of transport, both of goods and of people.

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AGRICULTURAL REGIONS OF NORTH AMERICA

PART IX—THE NORTH PACIFIC HAY AND PASTURE REGION

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THE North Pacific Hay and Pasture Region comprises the humid portion of the Pacific Coast. It includes a narrow coastal lowland; the coast ranges of mountains; the Sierra Nevada and Cascade mountain ranges; and, more important agriculturally, the lovely valleys that lie between the Coast and Cascade ranges, mostly in the United States portion of the region; also the Matanuska Valley in Alaska. It is a long, narrow belt of mountains and valleys, some of which are sunk beneath the sea—the most mountainous and the most beautiful part of North America. The region extends over 2,500 miles along the coast from the Alaska Peninsula and the Alaska Mountains to Monterey Bay on the California Coast, about 60 miles south of San Francisco, with an interior prong down the Sierras to the Tehachapi in south-central California. In width, the region varies from about 300 miles in southern Alaska to 100 miles in southern Oregon, and only 50 miles in the Sierra prong in California. The average width is 170 miles, and the total land area about 465,000 square miles, or 300,000,000 acres. Of this total approximately 104,000,000 acres are in Alaska, 118,000,000 acres in British Columbia, and 78,000,000 acres in Washington, Oregon, and California. The region is about as large as the

Cotton Belt, and 60 per cent larger than the Corn Belt, but has only two per cent as much land in crops as either of these regions.

Primarily, the North Pacific Hay and Pasture Region is a forest region. It contains, largely on mountain slopes, the most magnificent stand of timber in the world. The forest originally occupied the valley floors also, except that there were a number of extensive prairies in the Willamette and Umpqua Valleys, while the floor of the Rogue River Valley was largely grassland and brush. Forests originally covered probably 95 per cent of the land of the California, Oregon, and Washington portion of the region¹ and still cover about 93 per cent, but more than half of the British Columbia portion is high mountain land, where the climate is so cold that it is reported as "land not suited for production of forests of commercial value."² This is probably true of the Alaska portion also.

¹ The non-forested area consisted principally of mountain land above timber line, and prairies in the Willamette Valley.

² Legend of map entitled "Forest Stand Types in British Columbia" accompanying report on "Forests in British Columbia" by H. N. Whitford and Roland D. Craig, Commission of Conservation of Canada, 1917. This map, which was not known to the writer when he prepared the agricultural region map published in the October, 1926, issue of *Economic Geography*, shows that the eastern boundary of the North Pacific Hay and Pasture Region is drawn fully 30 miles too far east in the vicinity of Hazelton, B.C., and that the Upper Fraser Prong of the Forest and Hay Region should be extended west-



FIGURE 247.—Only the United States portion of the North Pacific Hay and Pasture Region is shown in this hachure map. But the portion in British Columbia and Alaska is even more mountainous than the portion in the United States. It will be seen that the principal area not too mountainous for farming is the valley extending south from Puget Sound to the Rogue River Valley in southern Oregon, but broken by a low mountain range between the Umpqua and Rogue River Valleys. A smaller belt of land topographically suitable for farming borders the coast from the Olympic Mountains southward. In Washington there is a considerable area of fairly level land in this coastal belt, and in the Chehalis Valley which connects it with the Puget Sound Valley to the east; but in Oregon the coastal belt is not so wide, and in northern California there is almost no coastal plain, the agriculture being found mostly in the parallel valleys which drain to the coast through Humboldt and Mendocino counties. Figure numbers in the North Pacific Hay and Pasture Region refer to (1) Sierra Sub-region, (2) Rogue River Valley, (3) Umpqua Valley, (4) Willamette Valley, (5) Cowlitz Valley, (6) Puget Sound, (7) Vancouver Island, and (8) Fraser Valley. (Map photographed from two drawings for relief map prepared by F. J. Marschner in Atlas of American Agriculture, U. S. Dept. of Agric.)

Only about one per cent of the land area of the North Pacific Hay and Pasture Region is in crops, and two per cent is in pasture. Nevertheless, the intermontane valleys in western Oregon and Washington and southwestern British Columbia, as well as an irregular band of tillable land along the coast and the scattered farms in the Sierra and Cascade ranges, together with the fact that the agricultural products of the region will tend to increase and the forest products to decrease, justify calling it an agricultural region. The value of the annual cut of lumber, roughly \$250,000,000 in the United States portion and \$90,000,000 in British Columbia, is nearly 50 per cent greater than the value of all agricultural products. This ratio is true of the Canadian as well as the American portion of the region.

The agriculture of the North Pacific Region resembles that of the northeastern United States and eastern Canada more closely than does the agriculture of any other western region. Dairying is the dominant system of farming, and, as in the Northeastern states, it is based principally on hay and pasture, with a relatively large expenditure for mill feed or grain for the cows. The production of poultry and eggs is also a very important industry, the value of poultry products, according to the census of 1924, being about two-thirds as great as that of dairy prod-

ucts. Much less important is the production of beef and of lamb and wool, while there were only about 260,000 hogs in the region January 1, 1925, which is about as many as in three typical counties of Iowa. The sales of livestock and livestock products constitute considerably more than half of the total sales of farm products. The principal crop products sold from farms are fruit, potatoes, vegetables, and wheat. The value of the fruit crop normally exceeds that of the poultry products.

The conjunction of dairying with poultry and egg production as dominant systems of farming suggests a large urban population to be fed, and such is the case. Next to the South Pacific Region, the North Pacific Region is the most populous area in the West. Four metropolitan districts with a combined population of nearly 1,000,000 front on Puget Sound, while Portland, Oregon, located near the mouth of the Willamette River where it flows into the Columbia, has a population of over 300,000. The total non-farm population of the region is about 2,800,000 whereas the farm population is only about one-seventh as great.³ These large local markets for fresh milk, eggs, and small fruits—perishable products—in a region of relatively little good farming land, and this partly covered with very large forest trees, involving a heavy expense to clear, have been influential factors in causing the development of the intensive types of farming. The farms are small, averaging in the United States portion in 1924 about 22 acres of harvested crops per farm, 10 acres

ward from Fort George to include much of the Nechako River Valley, also an area lying between François and Ootsa Lakes and the Bulkley Valley as far northwest as Hazelton. The line on this Forest Stand map of British Columbia dividing the coast forest from the interior forest might be accepted as the boundary between the North Pacific Region and the Northern Forest and Brush Region, but, from the standpoint of potential agricultural use of the land, the eastern base of the Coast Mountains seems preferable.

³ In the British Columbia portion of the region there were only about 10,000 farms in 1921 and a farm population of probably 40,000. It may be 50,000 today, whereas the non-farm population is about 400,000.

of plowable pasture, and 26 acres of other cleared pasture.

The region produced crops in 1919 having a farm value of about \$115,000,000, but, owing to the fall in prices, the value may be somewhat less today, despite a notable increase in production. The United States portion of the region produced crops having a value of about \$100,000,000 in 1919, which was less than one per cent of that of all crops in the nation, but the average value per acre was \$50, which is 25 per cent greater than the average for the United States as a whole. Fruit, potatoes, vegetables, wheat, and other crops used directly for human food constitute about two-thirds of the value of all crops in the region, which resembles in this respect the South Pacific Region, while feed crops (for farm animals) contribute only one-third of the value. These feed crops, however, supplemented by the sustenance supplied by the pastures, which is probably equal to that supplied by the feed crops, and also by a large quantity of imported grain and mill feed, resulted in the production of animal products having a value almost equal to that of all the crops. Half of the value of all crops grown in the region was contributed by the Willamette Valley of Oregon, but only about one-fourth of the value of the animal products. The value of the animal products of the region in 1924, plus the value of crops not fed to farm animals, was about \$175,000,000, which gives an average of less than \$1,700 per farm. Out of this amount expenditures for feed grains, fertilizers, and labor were paid.

PHYSICAL CONDITIONS

The northern end of the North Pacific Hay and Pasture Region,

where the Alaska mountains slope down into the Tanana Valley, is about latitude 64° N. while the southern end in the Sierra Nevada of California is about latitude 35° ; yet, the climate, as well as the topographic conditions, is not very different in the southern Sierra from that in the Alaska mountains. Along the coast also the climate is extraordinarily similar, considering the vast range in latitude. The July temperature at Anchorage and other points on Cook Inlet, which is the northernmost indentation of the Alaskan Coast, averages 55° , and at San Francisco averages 57° . In January, however, the Alaskan Coast is 20° to 30° cooler than the California Coast.

BOUNDARIES

The eastern boundary of the region is, in general, the edge of the forest along the eastern foothills of the Sierra-Cascade Mountains in the United States, but along the Coast Range in British Columbia, it is supposed to be drawn along the eastern base of the mountains (Fig. 247). In northwestern British Columbia and to a less extent in Alaska, mountains and valleys interlace and the forests are more continuous in the lowlands than in the uplands, so the boundary is drawn, supposedly, along the eastern and northern foot of the St. Elias and Alaska ranges. The forested portion of the Alaska Peninsula, as well as a large area of upland tundra and icefields is included in Alaska and British Columbia. The boundary on the west is the Pacific Ocean. In California only the originally forested coast as far south as Monterey Bay, the Coast Ranges west and northwest of the Sacramento Valley, and the Sierra Nevada are in-

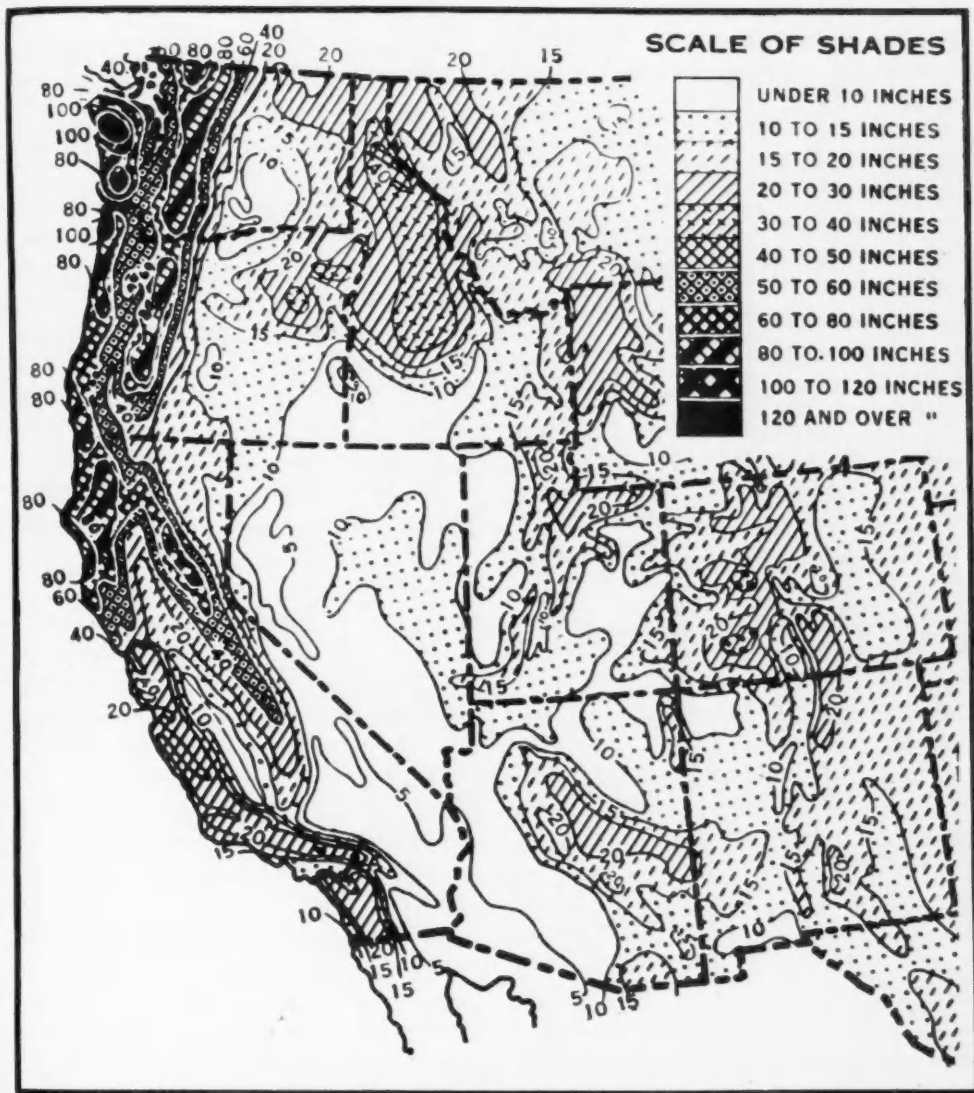


FIGURE 248.—The North Pacific Region receives along the coast and in the Cascade Mountains the heaviest rainfall in North America, generally exceeding 80 inches. But, in the Valley extending from Puget Sound southward to southern Oregon, which lies in the rain shadow of the Coast Range, the rainfall (including snowfall) is only 35 to 60 inches. On the floor of part of the Rogue River Valley and on the larger islands of Puget Sound, the precipitation is less than 30 inches—indeed, at Port Townsend and at Coupeville, in Island County, and at Ashland in the Rogue River Valley, it is only about 20 inches. Nearly all the precipitation occurs in the fall, winter, and spring, the July, and likewise the August, rainfall usually being less than an inch in the agricultural portions of the region. Note how sharply the rainfall diminishes along the eastern margin of the Cascade Mountains. (Map from 1921 Yearbook, U. S. Dept. of Agric.)

cluded. Here, as elsewhere, except in the extreme north, the boundary is drawn along the lower limit of the forest. The North Pacific is primarily a forest region as contrasted

with the grassland or chaparral of the South Pacific Region, and the grassland and sage brush of the Grazing and Irrigated Crops Region to the east.

CLIMATE

The climate of the North Pacific Hay and Pasture Region is greatly influenced by its nearness to the ocean, and secondarily by mountain ranges which trend, more or less, at right angles to the westerly winds coming off the Pacific. These winds are chilled on ascending the western slopes of the mountains and forced to deposit part of their moisture. But, as the winds descend the eastern slopes, the air becomes warmer, principally because of the increasing pressure, and the valleys, consequently, have a much lighter rainfall than the littoral or the mountain slopes. A third influence is the difference in temperature between land and water, the land being warmer than the ocean in summer and colder in winter. Consequently, the winter rainfall is heavy and the summer rainfall is light, particularly in the warmer valleys. A fourth influence deserves mention—the Japan Current flows along the coast from north to south, tending to counterbalance the influence of latitude.

The result of these and other influences is a humid climate like that of the eastern states and Canadian provinces, and unlike the other regions in the West (Fig. 248). But this climate differs from that in eastern North America in having a very wet winter and a very dry summer. The summers are especially dry in the valleys, less than four inches of rain falling during the summer (June, July, and August) in the Willamette Valley and most of the Puget Sound Basin, and less than two inches in the Rogue River and Umpqua Valleys, also in the southern Willamette Valley, and locally in the southeastern

portion of Vancouver Island.⁴ In the Matanuska Valley of Alaska, spring is the driest season, the total precipitation for the three spring months averaging less than three inches.

Despite the dry summer, the average annual precipitation (rain and snow) along the immediate coast is the heaviest in North America, exceeding 100 inches at several stations, and 70 inches at most of the stations. In the valleys, however, the annual precipitation is much less—20 to 35 inches generally in the Rogue River Valley, 25 to 45 inches in the Umpqua Valley, 35 to 55 inches in the Willamette and Cowlitz Valleys, 30 to 60 inches in the Puget Sound Basin, except that on most of the islands and near Port Townsend and Victoria, in a district that lies in the rain shadow of the Olympic Mountains, the annual precipitation is less than 30 inches, and at some stations less than 20 inches. In the Matanuska Valley of Alaska the annual precipitation is only about 15 inches, but owing to the low evaporation this is usually sufficient to produce good crops. On the mountains that lie back of these valleys, all the way from California to Alaska, the annual precipitation is almost as heavy as along the coast.

About three-fourths of the precipi-

⁴ Principally because of this low summer rainfall, it has been found profitable to irrigate the crops in the Rogue River Valley, and also around Port Townsend, Washington, where, although the summer rainfall is about 3 inches, the annual precipitation is only about 20 inches. The summer rainfall is less than two inches at Victoria and several stations located nearby; but, as the annual precipitation is 25 to 35 inches, there is little, if any, irrigation. This area, represented by Port Townsend and Victoria, has also a much drier winter than other sections of the North Pacific Region, except the Rogue River Valley, and a very early and delightful spring. There are practically no fogs or zero weather. On the whole this Victoria-Port Townsend district possesses one of the most pleasant climates in the world, resembling southeastern England in many respects.

tation throughout the region, mostly rain, falls during the six months, October to March inclusive, much of it gently, almost a drizzle. A 24-hour rain will seldom amount to an inch. December is the wettest month in western Oregon and also on Vancouver Island, November at many stations in western Washington, and October along the Alaskan Coast. During November and the three winter months, rain usually falls on half to three-fourths of the days, except in southern Oregon, but there are occasional sunshiny days during the winter. The number of clear days during the year ranges from 75 along the west coast of Vancouver Island and Washington, also in the Puget Sound Basin, to 150 in the Rogue River Valley, but in most of the region the number is less than 100. This is a little less than in the Great Lakes region or New England, but most of these clear days along the North Pacific Coast, except in the Alaska portion, occur during the summer season.⁵ The number of days with dense fog is about 30 in the valleys and 40 to 50 along the coast. The fog is practically confined to the winter season.

A second climatic characteristic of the region is its cool summers and mild winters. The average summer temperature along the coast is between 55° and 60° all the way from San Francisco to and including the Alaskan Panhandle, except that it falls slightly below 55° at Point Reyes and Eureka, California; Tatoosh Island, Washington; and probably on the beach along the entire

coast. In the Matanuska Valley of Alaska it is about 54°, yet hardy spring wheat is grown. Back from the coast in most of western Oregon and Washington, the average summer temperature is between 60° and 65°, except in the Rogue River Valley of southern Oregon, where it is slightly higher. The average summer temperature is also between 60° and 65° on the eastern side of Vancouver Island and on the mainland opposite, except near the water, where it falls just below 60°. For comparison it may be noted that such summer temperatures are found in the east in the White Mountains of New Hampshire, the Adirondacks, and the Upper Peninsula of Michigan. The average daily maximum temperatures in July along the littoral are 60°, in the Puget Sound district 70°, and in the Willamette Valley 80°. The minimum daily temperature is below 50° throughout the region. Temperatures exceeding 90° occur several times during the summer, except at some Puget Sound stations and northward along the littoral.

The winter temperatures in western Oregon and Washington, on the other hand, which are mostly between 40° and 50° in the agricultural portions of the region, except that they are 1° to 3° lower in southwestern British Columbia and in the Cowlitz Valley of western Washington, are as warm as in the Carolinas and Arkansas. A few figs are grown in the southern portion of Vancouver Island, and the census also reports a few fig trees in western Washington. Even along the Alaskan coast the winter temperature averages about 30°, which is the same as at St. Louis and Pittsburgh. In the Matanuska Valley, however, where most of the agricultural settlement in the

⁵ The records along the Alaskan Coast show generally 7 to 9 clear days in each month, except October, which averages only 5 clear days. An excellent summary of climatic conditions in Alaska is contained in the March, 1930, issue of the *Monthly Weather Review*, "The Climates of Alaska," by Edith M. Fitton.

Alaskan portion of the region has taken place, the average winter temperature is about 16° , which is similar to that at St. Paul, Minnesota. In the Oregon and Washington portions of the region the number of days with minimum temperatures below freezing ranges from only 15 along the coast to 30 and 40 in the valleys, and the lowest temperature ever observed

frost to killing frost exceeds 200 days (Fig. 249). In nearly all the agricultural sections, except those in Alaska, the average frost-free season exceeds 180 days.⁶ In the Matanuska Valley of Alaska the frost-free season is about 130 days long. For comparison it may be noted that the 200 days frost-free season line follows quite closely the northern boundary of

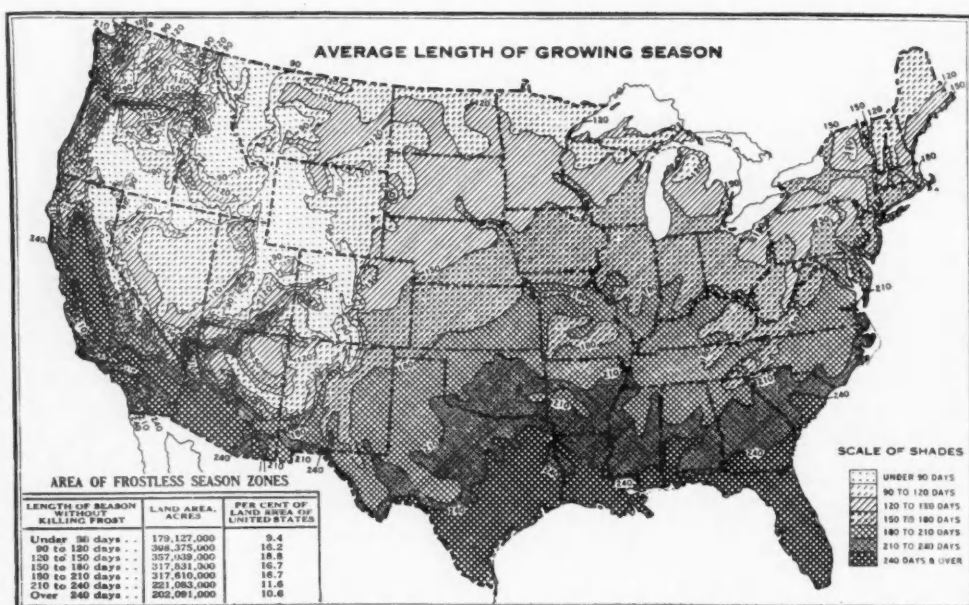


FIGURE 249.—The strong influence of the on-shore winds is evident not only in the heavy rainfall of the North Pacific Region, but also in the long frost-free season. Along the ocean shore the season between frosts is as long as in the northern portion of the Cotton Belt. But, the summers are as cold as along the northern margin of the Wheat Belt in Canada. Wheat is grown only in the warmer valley east of the Coast Range, where the frost-free season, however, is, in general, only 150 to 200 days. The long growing season and the generally heavy rainfall have favored the use of the land for pasture and the development of dairying. (Map from 1921 Yearbook, U. S. Dept. of Agric.)

is about zero. In general, the average annual minimum temperature, except in the Matanuska Valley, is 10 to 20 degrees.

As might be expected from the mild winter temperature, the frost-free season is long along the littoral of northern California, Oregon, and Washington, and near the water in Puget Sound and the Straits of Georgia; also in much of the Willamette Valley the season from killing

cotton production in the eastern United States, while 180 days is the length of the season at Boston, New York, Cincinnati, and Kansas City, and 130 days at Augusta, Maine, Eau Claire, Wisconsin, and Fargo, North Dakota. But along the littoral, where the frost-free season is the longest (about 210 days in Washing-

⁶ At Victoria, B. C., the frost-free season is reported to average 271 days, but it is much shorter at stations a few miles inland.

ton and Oregon), the summers are the coolest, so cool in fact that wheat can scarcely be ripened. Even in the interior valleys, where the summer temperatures are higher, only a little corn is grown, and this mostly for silage (except in southern Oregon).

Although the proportion which the actual hours of sunshine constitute of the total possible sunshine averages in most of the region less than 30 per cent in winter and only 50 to 60 per cent in summer, there are places in the region, notably Victoria and the Rogue River Valley, where the proportion is as large as in the desert region east of the Cascade Mountains.⁷ The velocity of the wind is very low in most of the region, averaging only 4 to 8 miles per hour.

In brief, the climate along the littoral is strongly marine, but in the valleys it is considerably modified by the land influence, this influence varying largely with the height of the Coast Range of mountains. In parts of these valleys the climate approaches the ideal as closely, perhaps, as in any other portion of North America.

TOPOGRAPHY

The agriculture of the North Pacific Hay and Pasture Region is located mostly in the valley bottoms and adjacent foothill slopes of that long structural trough which extends from the Siskiyou Mountains on the California-Oregon boundary to Queen Charlotte Sound and beyond. From Puget Sound northward a large proportion of this trough is covered with the waters of the Sound and Straits of Georgia. The Matanuska and Susitna Valleys in Alaska are similarly

located between a coast range of mountains and a higher range (the Alaska or Pacific Mountains, locally called the Talkeetna Mountains) farther back, which protect the valleys from the extremes of climate of the interior. About 15,000 farms are found along the littoral of Washington, Oregon, and northern California, principally where there is a bit of coastal plain or where a stream has developed a valley bottom of sufficient width to justify clearing the land for agricultural use. In the Sierra Nevada of California there are about 5,000 farms scattered along the mountain streams where there is a little valley land, and in the basins near the divide.

Topographic conditions, therefore, divide the region into four parts:

I. The interior chain of valleys in western Oregon and Washington and southern British Columbia, called successively, from south to north, the Rogue River Valley, the Umpqua Valley (which, like the Rogue River Valley, drains through a mountain gap westward into the ocean), the Willamette Valley (which drains north), the Cowlitz Valley (which drains south), the smaller Chehalis River Valley (which drains west), and the Puget Sound Basin, with which is included the lower Fraser Valley and the agricultural land that lies along the Straits of Georgia, mostly on the Vancouver Island side (Fig. 247).

The area in the Rogue River Valley topographically suitable for agriculture is about 50 miles long, but only a few miles wide, while the potentially arable area in the Umpqua Valley is about 60 miles long by 15 to 30 miles wide, and in the Willamette Valley about 125 miles long by 20 miles wide at the southern end, increasing

⁷ The hours of bright sunshine per year at Victoria average 2,176, which is the highest in British Columbia.

to 50 miles at Salem and then narrows at the northern end at Portland. The Rogue River Valley contained 122,000 acres of improved farm land in 1920, the Umpqua Valley about 130,000 acres, and the Willamette Valley 1,313,000 acres.

North of Portland, along the Columbia River, the valley narrows to 30 miles or less at Kalama, and it continues about this width up the Cowlitz River and across into the Chehalis River drainage. In this section of the trough between Portland and Puget Sound there were in 1920 about 225,000 acres of improved land. The Chehalis drainage section merges imperceptibly into the Puget Sound Basin, along which there are narrow and interrupted belts of arable or potentially arable land on each side.

On the east side of the Sound the river valleys are pretty well cleared and in agricultural use, but the uplands remain largely uncleared. This belt of intermingled lowland and upland averages, perhaps, fifteen miles in width, except at the Canadian border, where it increases to 25 miles. It contained in 1920 about 320,000 acres of improved land. Just north of the border, in British Columbia, lies the lower Fraser River Valley, which contained about 125,000 acres of improved land in 1921, over 75,000 acres of which were in crops. In this valley and vicinity there may be three times as much potentially tillable land (after clearing) yet unimproved. To the north of this valley (north of Vancouver) there is little land on the east side of the Straits of Georgia topographically suitable for agriculture, except, possibly 100,000 acres in the Bella Coola and Skeena Valleys. On the west side of the Sound in the

United States there is much less potentially arable land than on the east side and scarcely a fifth as much under cultivation (70,000 acres improved in 1920); but in British Columbia there is a considerable amount of land, mostly in the southeastern portion of Vancouver Island, topographically suitable for cultivation after clearing, possibly 500,000 acres, of which only 45,000 acres were improved in 1921.⁸ On the islands in the Sound and Straits of Georgia there were 40,000 acres of "improved" land in 1920, and at least twice as much more that might be brought under cultivation. In the entire chain of interior valleys there were about 2,400,000 acres of improved land in 1920 or 1921.

II. The second sub-region consists of the Sierra Nevada Range in California with its small agricultural areas and isolated farms or ranches scattered among the narrow valleys and mountain basins. In the aggregate, however, there were 500,000 acres of improved land in this sub-region in 1920, and it is probable that there is two or three times as much

⁸ Since this paragraph was written the following letter has been received from F. C. Green, Surveyor General of the Department of Lands of British Columbia:

"Since writing you on January 2nd, I have consulted with those within reach having the most intimate knowledge of the British Columbia lands west of the Coast Range and the estimates arrived at so nearly agree with those of Messrs. Whitford and Craig, given in their report published in 1918 by the Commission of Conservation, Ottawa, that I am giving you the latter as our estimate.

| Region | Total Area (Square Miles) | Agricultural Land Partially Timbered (Square Miles) | Per Cent |
|---------------------------------|---------------------------------|--|-------------|
| Southern Mainland | 8,775 | 1,150 | 13 |
| Vancouver Island, East Coast | 5,789 | 880 | 15 |
| Vancouver Island, West Coast | 4,655 | 180 | 4 |
| Northern Mainland Coast . . . | 8,730 | 190 | 2 |
| Queen Charlotte Islands | 3,500 | 1,300 | 37 |
| Total | 31,449 | 3,700 | 12" |

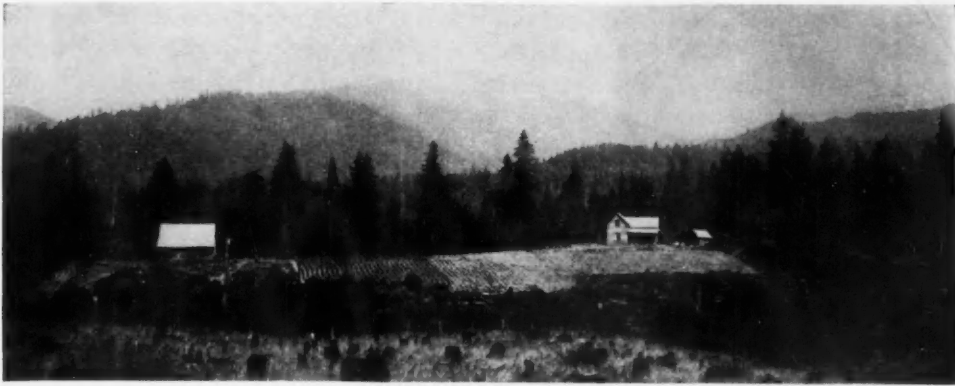


FIGURE 250.—A farm in the Upper Salmon Valley of Washington. This valley, though opposite Hood River Valley, is completely forest covered in the upper reaches. Note the stumps and tall grass in the foreground, the young trees coming in along the rail fence beyond, and the rows of small fruit trees near the house. (Photo by G. H. Miller and S. M. Thompson, formerly of U. S. Bur. of Agric. Econ.)

land topographically available for cultivation. The acreage of improved land has been declining in this region for several decades. As agriculture becomes more commercialized, and larger and larger units of machinery are introduced, the small fields and the hilly surface in this, as in other mountainous districts, become serious handicaps, and many of the young people, being free to move, leave the farms for the cities or other districts where there is greater economic opportunity.

III. The ocean littoral which may be divided into two sections: (a) an unglaciated and narrow coastal plain or terrace, often interrupted by mountains that descend to the sea, and sometimes including a foothill zone with valleys projecting inland, which extends from Monterey Bay northward to the Olympic Peninsula; and (b) a profoundly glaciated portion from Vancouver Island northward along the coast of British Columbia and Alaska. In this northern portion there is little agricultural land, the glaciers having gouged the valleys into deep fiords with steep mountain slopes rising

abruptly from the water's edge. Only here and there, usually where some stream has built a small delta, mostly at the head of the fiords, or on a tidal flat or stream terrace, is there a little land available for farming. The largest areas are in the Bella Coola and Skeena Valleys.

In the unglaciated portion of this littoral sub-region, including the valleys in the Coast Range, there were about 500,000 acres of improved land in 1920, three-fifths of which was in the California section. There is very little agriculture in this littoral zone north of Gray's Harbor County, Washington—probably not 25,000 acres of improved land in all—and the area of land topographically suitable for crop production is small.

IV. The fourth sub-region includes the Susitna, Matanuska, and Copper River Valleys in Alaska, with which is included the potentially arable land around Cook Inlet. In these districts there are, perhaps, 2,000,000 acres topographically suitable for crop production, but as yet there are only about 300 farms in the entire sub-region, totaling possibly 5,000 acres of improved land. Nearly all

the 150 farms in the Matanuska Valley are located on bench lands, 25 to 200 feet above sea level, and having mostly a south slope.⁹

SOILS

The soils in the North Pacific Hay and Pasture Region have been classified broadly into six groups:¹⁰

"(1) Residual soils, or those formed directly from weathering of underlying rocks in place and including (a) soils of the rolling to hilly upland districts, (b) soils of the rough, mountainous districts.

"(2) Soils derived from alluvial material deposited over former flood plains of the larger streams or as outwash plains. They occupy terraces now elevated well above existing flood plains. This group is subdivided into (a) soils derived from glacial material; (b) soils derived mainly from non-glacial material.

"(3) Soils derived from recent al-

⁹ Dr. H. W. Alberts, Director of the Alaska Agricultural Experiment Station, writes as follows:

"... I have no figures at hand regarding the number of farms in Alaska except that there are 151 patented homesteads in the Matanuska-Susitna Valley. Each farm has from 10 to 20 or more acres of cleared land. I believe that there are approximately 50 homesteads in the Homer region on Kenai Peninsula and about 75 in the Fairbanks region.

"There are several regions in Alaska where wild hay could be made, but at the present time most of the hay that is produced is peas and vetch grown on cultivated land. I wish I could give you a definite figure on the acreage in pasture, but am unable to do so at this time. There are probably 2,000 acres in pasture land in Southeastern Alaska, and 20,000 acres in pasture on the Aleutian Islands. Land is pastured only in summer in the Matanuska and Tanana Valleys."

¹⁰ Reconnaissance Soil Survey of Southwestern Washington. By A. W. Mangum and party, pp. 2125-2126, U. S. Bureau of Soils, Washington, 1911. More space is given to the description of the soils in this North Pacific Region than in previous papers of this series, not only because the soils determine in large measure the utilization of the land in this region, but also because the unusual diversity of physical conditions affords an opportunity to point out some of the relations of climate, topography, parent material, mode of origin, age, and vegetation to the development of the soil.

luvial flood plain and delta deposits which include (a) soils of the recent or present flood plains and (b) alluvial and sedimentary estuarine deposits of tidal flats and river deltas.

"(4) Soils derived from deposits in shallow lake basins or poorly drained depressions, mainly of lake-laid sediments.

"(5) Soils derived from marine beach and from eolian or wind laid deposits.

"(6) Soils derived mainly from accumulations of organic matter.

"Under the above broad grouping of the soil material the soils have been further classified into soil series and soil types. The separation into soil types is based upon differences in color, texture, and structure of the soil and subsoil material, origin, processes of formation, and relation to agriculture. The soil series include soils similar in all the characteristics mentioned, with the one exception of texture."

Nearly all the soils of the region have the characteristics of soils in a humid climate, i.e., marked differences between surface soil and subsoil, particularly the washing down of the clay particles into the subsoil, and the leaching out of the lime, and other soluble salts.¹¹ The duration of time the soils have been exposed to the climatic influences determines, therefore, in large degree, their fertility. The residual soils, owing to the rolling to mountainous topog-

¹¹ In the Rogue River Valley and locally in the Umpqua Valley, in areas originally clothed with grass, fairly typical "chernozem" or black-earth soils have developed. Such soils are wholly different from humid-climate forest soils in that they have an accumulation of lime and other salts in the subsoil, are black or very dark in color though well-drained, and are high in humus and in most of the mineral elements of fertility. These chernozem soils partake more of the character of the soils in the South Pacific Region than of those in the North Pacific Region.

raphy, which has facilitated erosion and the washing away of the leached material, are fresher, less leached, but also often more porous than the soils derived from the old valley-fill terraces and outwash plains of non-glacial origin. Of course, being hilly or rolling, they are not so well adapted to the use of machinery. Their principal agricultural use is for

rains of centuries, and owing to their fertility and greater moisture content in the dry summer season, they have accumulated somewhat more humus, or organic matter, than the upland soils. They are, however, subject to flooding, and frequently are diked, especially in the deltas. In the glaciated portion of the region these river bottom and delta soils, though



FIGURE 251.—A farm located on terraces along the Fraser River near Lytton, British Columbia. This picture, like the preceding, was taken near the eastern margin of the North Pacific Region, as indicated by the open growth of pines in the foreground, instead of Douglas fir. The mountain scenery, however, is characteristic of most of the British Columbia portion of the North Pacific Region. (Photo taken by Gus. A. Maves, Shoal Bay Beach, Victoria, B. C., and courteously provided by British Columbia Dept. of Agric.)

pasture, hay, and fruits, pasture requiring no use of machinery, while the hilly surface provides air drainage and relative freedom from frost for fruit. The most fertile soils, in general, are those of the present river flood plains and deltas. Being derived from recent deposits by the rivers in flood, time has not permitted these soils to have the lime and other salts leached out by the

small in extent, constitute a large proportion of the cropped land.

The residual soils are found in the foothills and mountains, which are, for the most part, of basalt or andesite, or of granite in the Sierras. The rocks in the Oregon-Washington portion on weathering produce mostly the Aiken series of soils, which are red in color and well drained; the Olympic soils which

are brown soils with a heavier subsoil; the Cascade series which are like the Olympic series but have a yellow subsoil, mottled with gray, indicating poor drainage; and the Viola series, which are like the Cascade, but have a heavy clay layer at 2 to 3 feet depth. In the Coast Range, however, of Oregon and Washington, and extending southward into California and northward on to Vancouver Island, there are extensive areas of shale and sandstone and a little limestone, which give rise to the Melbourne, Carlton, and Sites series of soils. Owing to the interbedding of the sedimentary rocks with the igneous in places, and the long period of weathering, these soils derived from sandstone are sometimes so similar to those derived from basalt that only microscopic examination can detect a difference. The residual soils constitute 20 to 60 per cent of the potentially arable land of the region, varying with the county or district.

The soils derived from old material washed into the valleys in Tertiary times and later, as a result of the process of leaching during so long a period, are mostly low in soluble matter, commonly acid in reaction, and the finer clay material has been accumulated in the subsoil, which is, therefore, generally heavier textured than the surface soil. These "valley-filling" soils have usually a level to rolling surface and are widely distributed throughout the valleys and terraces. "Differences in the original material, combined with differences under which the deposits have weathered, have resulted in the formation of soil types representing ten soil series. Of these the Salem, Clackamas, and Sifton soils are underlain by gravels; the Amity, Con-

cord, and Powell by mottled subsoils, moderately compact; the Dayton and Holcomb series by gray or drab heavy, tenacious clays; and the Willamettes and Hillsboro series by well-oxidized subsoils, the former moderately compact, the latter light textured, friable, and pervious.

"The Willamette series is composed of types having brown, slightly compacted or slightly heavier textured subsoil, which becomes more mellow and friable, with increasing depth. Small rounded 'shot,' or iron-cemented concretions are common in places on the surface. The series is derived through the weathering of unconsolidated sedimentary or old valley-filling deposits under conditions which were favorable to drainage, aëration, and uniform oxidation. It is extensively developed throughout the Willamette, Tualatin, and Pudding River Valleys, and is one of the most important old valley-filling soils in the State."¹² These "valley-filling" soils in western Oregon constitute generally 20 to 30 per cent of the potentially arable land.

Very different in character are the soils derived from glacial material. These soils are practically confined to the Puget Sound, Washington, British Columbia, and Alaska portions of the region. As previously noted, these are very young soils rather than old, and the subsoil, instead of being heavier and less pervious, is usually gravelly and more pervious. "The soils derived from glacial till and drift, usually modified by water action, are found on the rolling uplands and lower foothills, and consist mainly of light textured gravelly or sandy loams, underlain

¹² *Soil Survey of Clackamas County, Oregon*, by A. E. Kocher, E. J. Carpenter, and K. S. Taylor, U. S. Bur. of Soils, Washington, D. C., 1921, p. 1649.

by deposits of sand and gravel or occasionally by compact deposits of silt or silty clay. . . . The soils usually contain a considerable portion of rounded gravel, and boulders of varying size are found scattered over the surface and embedded in the soil mass. . . . Owing to the porous character of both the soil and subsoil of the greater majority of the soils of this group, the natural drainage is usually excessive. . . . The soils representative of this type constitute the Everett, Clallam, and Whatcom series."¹³

The Everett series are the most extensive and remain mostly in forest or in a cut-over condition. A small acreage is in intensively cultivated crops, principally potatoes, fruit, and strawberries, and a larger acreage is used for pasture. This soil is not suited to the major crops. The Clallam series of soils are of finer texture, and are gray rather than brown in color. These soils appear well adapted to hay, oats, potatoes, and fruit. The Whatcom soils are still heavier—mostly silt, clay, and fine sand mixed with a fairly heavy subsoil. These soils are extensively developed in Whatcom County near the Canadian border, and, unlike the other glacial soils, are largely under cultivation with the staple crops and fruits.

In addition there are, in the Puget Sound district, soils derived from glacial outwash of fairly clean gravel covered with a layer of sand, which are so porous and droughty that trees do not grow. These prairies occur mostly south of Puget Sound and are of little agricultural value. There are also soils developed in

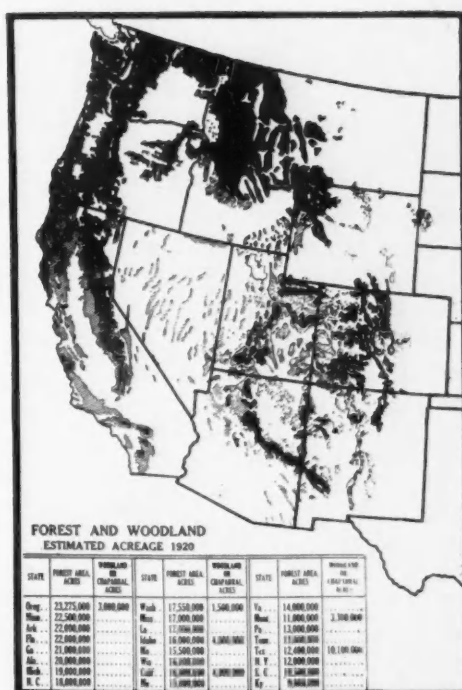


FIGURE 252.—The large extent of forest (black on the map) and woodland (shaded) in the North Pacific Region, and the small area cleared during the past 80 years, is indicated on the map. The principal area cleared, it will be noted, is in the Willamette Valley, which underwent agricultural settlement much earlier than western Washington. The area cleared in British Columbia, not shown on the map, is much smaller than in western Washington. (Map from 1921 Yearbook, U. S. Dept. of Agric.)

glacial lake basins and poorly drained depressions. These dark brown to black soils, classified in the Bellingham series usually, contain a high percentage of silt and organic matter, with a subsoil of more or less impervious silt or clay. "Inherently the soil is productive, and when drained is well adapted to farming," particularly hay, potatoes, and vegetables.

Considerably over half of the 5,000,000 acres of the land surveyed in the United States portion of the Puget Sound Basin is included in the Everett series of soils, while the Clallam series includes only 2 per cent, the Whatcom 3 per cent, the

¹³ *Reconnaissance Soil Survey of the Western Part of the Puget Sound Basin*, by A. W. Mangum and party, U. S. Bur. of Soils, 1910, p. 1525.

Spanaway (gravelly prairies) 4 per cent, and the Bellingham series nearly 3 per cent. About two-thirds of the soils in the Basin are derived from glacial material, but only about one-eighth of this glaciated area possesses fair or good agricultural soils.

It is not known whether such a proportion would hold true of the British Columbia section of the region, but some such proportion is probably true of the Alaska section. In Alaska most of the soils are younger even than in the Puget Sound Basin. As Mr. Georgeson, former director of the Alaska Experiment Station, notes, "It should be borne in mind that the soils of Alaska are new, the ice cap which once covered the continent as far south as Ohio remaining in these northern latitudes long after it had disappeared from the more southern latitudes. The glaciers still existing in Alaska are probably remnants of the ice cap, and the soil has been formed by attrition of rock particles, the movement of water, and the accumulation of vegetable matter. Vegetation could not cover the land until the ice melted and even then the accumulation of vegetable matter and the formation of soil would proceed slowly.

"In the coast region there are extensive areas of peat, formed chiefly from Sphagnum mosses. These are unsuited to grain growing. In well-drained areas the soils are clayey, sandy, and gravelly in character, with the gravelly type predominating. These must be fertilized to maintain their productivity. Sandy and gravelly soils, usually denominated warm soils because they absorb heat readily, have an advantage over other soils in that crops growing on them develop early and mature before frost. Silt

soil, which is very fertile, occurs in some well drained areas."¹⁴

The soils derived from recent alluvial deposits in the flood plains or first bottoms of streams in the North Pacific Region, and in the deltas, though of small extent, are very important agriculturally. In the unglaciated section of the region these soils occupy strips varying from a half-mile or less in width along the smaller streams to three miles along the rivers and constitute from 6 to 20 per cent of the area surveyed, varying with the county, but including from 10 to 30 per cent or more of the cultivated land. In the glaciated Puget Sound section the recent alluvial soils constitute about 12 per cent of the total area included in the survey on the east side of the Sound, but fully half of the cultivated land. A large area of such soils occupies the Fraser River bottoms in British Columbia only a few miles north of the boundary.

In the unglaciated part of the re-

¹⁴ "Cereal Growing in Alaska," Alaska Agricultural Experiment Station, Bull. No. 6, by C. C. Georgeson and G. W. Gasser, pp. 5 and 6.

The following note on the soils at the experiment stations, of which the Sitka, Kenai, and Matanuska stations are located in the North Pacific Hay and Pasture Region, is interesting:

"No two of the Alaska Stations have similar soils. At Sitka, where vegetation has been luxuriant for perhaps thousands of years, the surface soil is mostly humus and partly peat. Similar soil is not found in the interior. At Rampart the soil is a clay loam, which, though somewhat hard to cultivate, is well adapted to grain. At Fairbanks the soil varies with the contour of the surface. The best type of soil is the Tanana Valley silt which predominates on slightly rolling upland and is underlain by clay. At Kenai where grain growing was tried successfully for a few years, the soil is gravel, mixed with a small percentage of vegetable mold. At Copper Center the soil is thin and gravelly, being underlain with gravel. It lies in benches, each of which is comparatively level and drains readily. In the Matanuska Valley the prevailing soil is comparable with the predominant type of soil found in the Tanana Valley and is fertile and productive. So far as it is known, the Tanana and Matanuska Valleys have the best soils for grain growing and for general farming."



FIGURE 253.—This picture of the fish hatchery at Keyport, Washington, shows how dense the forest is along the shore and how rapidly a second growth comes in. (Photo by W. J. Spillman, U. S. Bur. of Agric. Econ.)

gion these recent alluvial soils consist mostly of the Chehalis series, which has a brown to reddish brown surface soil, with a deep subsoil of medium to heavy texture and good drainage, except when flooded; the Newberg series, which has a lighter subsoil and is subject to overflow only on the lower levels; and the Wapato series, which has a grayish brown surface soil and a compact mottled gray subsoil with imperfect drainage. In the glaciated section of the region the only important soil series is the Puget, at least in the United States portion.

These soils are "formed of material carried down by the rivers and deposited over the valleys in times of flood or in shallow bays at the mouths of the rivers, eventually building up extensive level delta lands. The light textured soils occur near the main stream channels where the coarser particles are laid down by the swifter currents. Farther back from the streams the coarser sandy deposits have been covered by a layer of a finer silty material laid down in the quieter waters. In depressions where water has collected in time of flood and remained for long periods the sediments of silt and clay are usually many feet deep and no coarse sandy material is found in the subsoil

to a depth of 3 to 5 feet,"¹⁵ but over the greater part of the valley the silt and clay form only a shallow covering (1 to 3 feet) over the underlying sand. ". . . The delta lands are not heavily timbered, and it is often necessary to drain and dike them before they can be farmed. They often support a growth of coarse marsh grasses. The soils of the river valleys often support a growth of cedar and other timber, but the land is not so difficult to clear as the uplands. The soils of this series are very productive and are classed among the best agricultural soils of the Puget Sound region."¹⁵

In addition to the six main classes of soils in the region there are several miscellaneous types of soil, principally muck and peat, tidal flats, river wash, and rough mountain land. The muck and peat occupy one to two per cent of the land, and where drained become valuable for the production of onions, cabbage, and celery. The tidal flats include less than one per cent of the area surveyed, and have practically no use, where not diked and drained, except occasionally for the cutting of marsh hay. The river wash has, generally,

¹⁵ *Reconnaissance Soil Survey of the Eastern Part of the Puget Sound Basin, Washington*, by A. W. Mangum and party, p. 1571, U. S. Bur. of Soils, Washington, D. C., 1911.

no agricultural use, while the rough mountain land is covered with forests, or has been cut-over and may be slowly restocking. This rough mountain land constitutes a quarter to a half of the area covered by the soil surveys, varying with the county, and it should be recalled that the soil surveys were intended to cover primarily the agricultural land.

The North Pacific Hay and Pasture Region is a beautiful country, but the mountains and the fiords and the magnificent forests that contribute to its beauty also cause most of the land to be unavailable for agriculture (see Figs. 250 and 251). The moist climate, which in times past made possible the extensive glaciation, and now provides conditions so favorable to the growth of coniferous forest, has also leached the soil of its lime and other soluble salts, and when the soils have been exposed to this leaching for a long time, as on the old Tertiary terraces in the southern, unglaciated portion of the region, some of the soil has not only lost a large portion of its fertility, but has also accumulated in the subsoil so large a proportion of clay that it becomes cold and intractable. On the other hand, the glacial ice, which made the fiords and still lingers on the highest mountains to lend beauty to the landscape, also removed much of the original mantle of soil in the northern and central sections of the region, and frequently deposited instead stoney materials, gravels, and sands which have not yet had time to decompose into good soils. It is seldom that a beautiful country has excellent soils, unless one loves the prairies, and the North Pacific Region is no exception to this rule.

But the recent alluvial soils along the rivers and in their deltas are

generally very fertile, while some of the old terrace soils (the Willamette) and most of the hill land in the unglaciated section are fairly productive. Man has done much in the region to overcome the handicaps of nature, and because of this progressive spirit, and of the excellent markets for many products afforded by the cities, as well as because of the small extent of tillable land available and the lovely scenery, land values are surprisingly high.

LAND UTILIZATION

The greatest obstacle to the agricultural utilization of the North Pacific Region, next to the mountainous or hilly topography and the low fertility of much of the soil, is the very heavy forest growth (see Figs. 252 and 253). The cost of removing the stumps, commonly three to six feet in diameter and sometimes eight and ten feet, is so great that often only intensively cultivated crops producing a high value of products per acre, such as fruit and vegetables, can repay this cost of clearing (see Figs. 254 and 255). Happily the prairies in the Willamette Valley and the river delta lands in the Puget Sound Basin, on which the stand of timber was much lighter than on the uplands, permitted the early development of agriculture on a small scale. The high prices of agricultural products paid by the gold miners of California during the fifties encouraged the advance of settlement in western Oregon, and a half century later the development of lumbering and the rapid growth of the commercial cities on Puget Sound stimulated agricultural development in western Washington and British Columbia. Still later the discoveries of gold in Alaska and Yukon Terri-

tory and the high prices paid by miners for food products led to the clearing of a little land for farming in Alaska, and provided an enlarged market for the products of western Oregon and Washington.

But the local market for fruits and vegetables is still relatively small, and competition with California products is severe, while climatic conditions are peculiarly favorable to

vated area has been slow, especially in recent years.

There are, perhaps, 500,000 acres of arable land in the Rogue River Valley, of which only a fourth was improved in 1920 and probably little more today; in the Umpqua Valley there is, perhaps, a little more potentially arable land than in the Rogue River, but a smaller proportion is improved; while in the Wil-



FIGURE 254.—Starting the farmstead near Alder, Washington. This picture shows a typical settler's house or "shack" and barn. It shows also, better than words, the laborious task of clearing the land of stumps and snags. (Photo by E. D. Strait, formerly of the Office of Farm Management, U. S. Dept. of Agric.)

dairying. Since neither corn nor alfalfa is well adapted to the climatic conditions in the region, except in the warmer and drier valleys of western Oregon and California,¹⁶ it becomes necessary to grow less productive feed crops, principally timothy and clover usually mixed in western Washington, orchard grass, and the small grains cut green for hay, oats, peas, vetch, and roots. These do not yield sufficient feed per acre to justify very high values for the land, and as the cost of clearing the forest is generally high, expansion of the culti-

lamette Valley there are probably over 3,000,000 acres of potentially arable land, of which about two-fifths was improved in 1920. In western Washington there may be 3,000,000, possibly 4,000,000, acres of potentially arable land, of which only a fifth or sixth was improved in 1920. Clearly, there is a large acreage of physically arable land in the United States portion of the region, and doubtless on Vancouver Island, also, available for agricultural expansion when the prices of farm products will justify the heavy cost of clearing.

In the United States portion of the region, which includes most of the agricultural land, there were less than 11,000,000 acres in farms in

¹⁶ Dr. James I. Jardine, Director of the Oregon Agricultural Experiment Station, writes, "The Willamette Valley now has between 15,000 and 20,000 acres of alfalfa. This has developed almost wholly since 1920."



FIGURE 255.—A stump pasture in western Washington. It greatly reduces the cost of clearing to allow a number of years for the stumps to rot before attempting removal. Meanwhile the land can be used for pasture. The acreage of woodland pasture in farms in the North Pacific Region is nearly twice that cleared and in crops. (Photo by E. D. Strait, formerly of the Office of Farm Management, U. S. Dept. of Agric.)

1924, as compared with 78,000,000 acres total land area, and of the 11,000,000 acres, only 2,000,000 acres were in crops. The acreage of pasture in farms exceeded the acreage in crops. Plowable pasture amounted to about 900,000 acres, other cleared pasture included 2,300,000 acres, and woodland pasture about 3,600,000 acres (see Figs. 255 and 256). It is clear that the climate, the rolling to hilly character of much of the land, and the character of the soil have all conspired to cause a large proportion of the farm land to be used for pasture, despite the cost of clearing, and to cause a concentration of crop production on the more fertile or favorably located lands.

In spite of the heavy cost of clearing the forest and the high value of cleared land having good soil, a considerable proportion of the plow land lay idle in 1924. There was about one-tenth as much crop land lying idle that year, in the region as a whole, as was in harvested crops. This ratio ranged from 6 per cent in western Washington to 9 per cent in the Willamette Valley, 18 per cent in the Rogue River Valley, and 35 per cent in the Sierra section of California. In the Sierra counties mining was an important industry for

many years, providing local markets for farm products; moreover, much of the land was cleared and brought under crop in the days before agricultural machinery came into common use. With the decline of mining, the building of railroads and roads, and the increasing severity of competition by products from the valley lands and elsewhere, many of these mountain farms have become as antiquated as the spinning wheel. Crop acreage has been declining in the Sierra for 30 years or more, and the process of reversion of crop land to pasture or forest is still in progress. In most of these mountain counties there is less than half as large an acreage in crops as there was thirty years ago.

In other parts of the region the idle land is not due so largely to changes in technique and economic conditions as to errors in judgment or knowledge. Most men have a longing for land. When they come into a new country, such as this North Pacific Region is in many parts, not realizing its peculiar characteristics, they lack a solid basis for judgment. Under such circumstances instinct often overcomes caution, especially if it be a beautiful country, and real estate men play on the imagination. So



FIGURE 256.—In addition to the woodland pasture in farms, there is woodland not in farms which is used for pasture, like that shown in this picture. Such woodland pasture is found mostly in the southern Oregon and California sections of the North Pacific Region. In the northwestern Oregon, Washington, and British Columbia portions of the region, where the rainfall is heavier, the forest is generally too dense to permit the growth of a sufficient amount of grass to be worth pasturing. (Photo by David Griffiths, U. S. Dept. of Agric.)

clearing the stumps from the land proceeds at great cost, and soon the investment becomes so large that it is too late to back out.

On nearly all the poorer- or medium-grade soils in the region farms can be bought for less than the cost of clearing the land. However, this is not a unique situation, for it exists over probably more than half of the originally forested area of the United States. Agriculture is a peculiar industry—farming is intimately associated with nature, and there are times of year, principally the winter season, when many farmers have little work to do. In a mild climate like that of the North Pacific Region, they can clear land at this time at a cost below that involved in the employment of wage labor, even if the most efficient machinery is utilized. Moreover, clearing slowly and allowing years for the stumps to rot greatly reduces labor. Meanwhile the stump land can be used to pasture and much of it is so used.

THE CROPS

Half the crop land in the North Pacific Region is in hay and a sixth is in oats. These two crops occupy, therefore, two-thirds of the crop area, and after the acreages of corn (mostly cut for silage or forage), barley, wheat for chicken feed, and the root crops are added, it appears that about three-fourths of the crop land is used to feed livestock. The other fourth is in wheat for flour, fruits, potatoes, vegetables, and hops. These crops, grown for human food, however, have a value considerably greater than the total value of the feed crops.

The principal kind of hay, considering the region as a whole, is grain hay, that is, oats, wheat, barley, and rye cut when green, and made into hay. Such hay can be grown during the moist winters and need not survive the summer drought. But in western Washington timothy and clover, grown separately or

mixed, become the leading hay crops, and in western Oregon there is a considerable acreage of orchard grass, rye grass, and other "miscellaneous tame grasses," the region in this respect resembling New England. There is only a little alfalfa in the region, owing to the very moist winter weather in most parts and the acid soils. In 1924, however, about 87,000 acres of alfalfa were grown in the region, mostly in the drier Rogue River Valley of southern

Willamette and the Rogue River Valleys. Three-fourths of the total corn acreage, and nearly all the acreage harvested for grain, is in the Willamette Valley. The acreage in grain in the Willamette Valley considerably exceeds that in hay, but in the other districts hay constitutes 60 to 80 per cent or more of the total crop acreage.

The fruit crops of the region possess a greater value than that of the hays or the grains, averaging prob-



FIGURE 257.—Harvesting wheat on Whidby Island, in Puget Sound, Washington. The average annual rainfall on this island is only 20 to 25 inches, but the winter and spring are moist while the summer is dry and favorable to harvesting. Whidby Island holds the North American official record for acre-yield of wheat—117.5 bushels per acre on 18 acres. This is, probably, the world's record also. The photograph was taken by Miss Adele Kaehler, of Whidby Island, and was most graciously supplied by Mrs. Frances Holbrook Pfeiffer, of Los Angeles, California. Mrs. Pfeiffer adds that Whidby Island wheat took prizes for quality as well as quantity per acre at the Chicago Wheat Exchange contest in 1919. It should be noted, however, that little wheat is grown in western Washington outside this drier zone of Island County and adjacent territory, and that the little which is grown elsewhere is mostly used for chicken feed.

Oregon and in the valleys of the Sierra Nevada in California.

A third of the crop area of the region is in grain. Oats for grain are grown principally in the Willamette Valley and in the Puget Sound section north of Seattle, extending northward into the Fraser Valley. A small acreage is cut and fed green in western Washington and along the northern California coast. Wheat is almost confined to the Willamette Valley (Fig. 257). The barley acreage is mostly divided between the

ably \$25,000,000 a year. The principal fruits grown are apples, prunes, the small fruits, and cherries. The apple trees, which contribute about a fourth of the value of all fruits, are found principally in the valleys of western Oregon (over 2,100,000 trees in 1924), with a small number in the Puget Sound and Chehalis districts of Washington (about 800,000 trees in 1924) (Fig. 258). In the British Columbia section there were about 250,000 trees in 1921, somewhat more than half in the Fraser Valley and

somewhat less than half in the southeastern portion of Vancouver Island. The prunes are practically confined to the Willamette and Umpqua Valleys and the adjoining county of Clarke in Washington. The Willamette Valley, including Clarke County, had over 5,000,000 prune trees in 1924, and the Umpqua Valley over

Valley, which is one of the leading pear-producing districts of the United States, having over 700,000 trees. Cherries (sweet) are an important crop in the Willamette Valley, Salem being one of the largest cherry canning points in the United States. There are also about 200,000 cherry trees in the Puget Sound district.



FIGURE 258.—Mt. Hood from Hood Valley, Oregon. This valley, famous for its apples, lies on the eastern border of the North Pacific Region. Although the surrounding hills are more or less forest covered, the agriculture of the valley is almost identical with that of the Yakima, Wenatchee, and other irrigated valleys in the Grazing and Irrigated Crops Region, so the Hood River Valley will be included with this region also. The picture is used here to illustrate the views in summer of the snow-capped peaks, mostly of volcanic origin, that crown the Cascade Range from Mt. Shasta in northern California to Mt. Baker in Washington, near the Canadian line. Mt. Ranier (Tacoma) is, perhaps, even more famous than Mt. Hood. (Photo from U. S. Bur. of Agric. Econ.)

1,000,000 trees (Fig. 259). The average value of the prune crop constitutes, perhaps, one-fourth that of all fruits. Pear trees are much less important, except in the Rogue River

Strawberries are grown principally in the Willamette Valley and the Puget Sound district (Fig. 260). In 1919 over 3 million quarts were produced in western Oregon, over 5



FIGURE 259.—A prune orchard in the Willamette Valley. In Oregon, unlike California, the prunes are shaken or knocked on to the ground, or on to sheets spread on the ground, then raked up and sent to the drying plants, since the sunshine is not sufficient to dry the prunes, as in California. The artificial drying proceeds so rapidly that the bruised fruit cannot spoil. (Photo from H. P. Gould, Bur. of Plant Industry, U. S. Dept. of Agric.)

million quarts in western Washington, and in 1920 over 1 million quarts in the Fraser River and Vancouver Island districts in British Columbia. The area in bush fruits and the value of the crop, about 4 million dollars, were almost double those in strawberries in 1919. During the decade since the census the industry has expanded, and the quick freezing process now promises to enlarge the market still further.¹⁷ Raspberries and blackberries are the principal small fruit crops in western British Columbia and Washington, especially around Puyallup; but loganberries were, and probably still are, more important in western Oregon, where large quantities are canned or made into juice (Fig. 261).¹⁸ There

¹⁷ The frozen berries are shipped mostly in 50 gallon barrels either by steamship or by refrigerator cars to Atlantic coast cities, where they are used by the confectionery trade. The average annual shipment is now about 75,000 barrels of strawberries, 30,000 barrels of red raspberries and 10,000 barrels of loganberries and blackberries. Recently small containers for frozen fruit have been developed for the retail trade.

¹⁸ The blackberry pack of the North Pacific Region exceeds 500,000 cases, the loganberry pack is about 400,000 cases, and the raspberry pack 250,000 cases.

are probably 25,000 acres of small fruits in the region, mostly in the valleys and the Sound district. Along the littoral the acreage is very small.

It should be noted also that cranberries are grown in the region, nearly 400 acres in 1919. Cranberries require a very acid soil, and are grown commercially elsewhere in the United States only on the sands of southeastern Massachusetts, of New Jersey, and of central Wisconsin. There were, likewise, nearly a thousand acres in currant and gooseberries in the region. By contrast (with reference to climatic and soil requirements), about 200,000 English or Persian walnut trees were growing in the region in 1919, mostly in the Willamette Valley, and nearly 2,000 almond trees, mostly in the California section.

The region is also well adapted to the production of vegetables, particularly of cabbage, kale, and other members of the mustard family; nevertheless, most of the vegetables are grown for home use. The farm



FIGURE 260.—This picture, showing strawberries and raspberries on the Holt farm at Milton, near Seattle, is a typical view in western Washington. Strawberries are the most important small fruit in the North Pacific Region. They are not only sold fresh, but also canned, and recently enormous quantities have been sent frozen in barrels to the Atlantic coast consuming centers. Note the rolling land surface, the forest, and the smoke in the distance from burning brush or stumps. (Photo by E. D. Strait, formerly of U. S. Dept. of Agric.)

value of vegetables grown for this purpose amounted to about 6 million dollars in 1919, an average of over \$60 for every farm in the region. The value of vegetables grown for sale was only about half this amount (Fig. 262). In view of the fact that the urban population outnumbers the farm population five to one, this small production of vegetables for sale is surprising. Since the census of 1920 was taken, the commercial production of vegetables has increased notably. Among the most important of the vegetable crops is lettuce, of which about a thousand carloads are now shipped out of western Washington annually. Production for home use greatly exceeds (per farm) that in California and resembles that in the densely settled farming lands of the East.

Potatoes are an important crop not included in the vegetable figures given above. There were 42,000 acres harvested in the region in 1924, and the value of the crop probably exceeded 6 million dollars. Like the other vegetables, potatoes are grown mostly in the Willamette Valley and

the Puget Sound district, but there are very few grown along the littoral. What proportion of the crop is grown for home use is not known.

Hops are an important crop in parts of the Willamette Valley, Oregon ranking first among the states with a production of 80,000 bales, grown on 16,000 acres in 1930.¹⁹ The principal center of production is in Marion and Polk counties in the Willamette Valley, but some hops are grown also in Pierce County, Washington, in British Columbia, and in Mendocino County, California.

Sugar beets have recently become an important crop also in the Puget Sound district. About five years ago a sugar factory was erected at Bellingham, and the acreage of beets, both in northwestern Washington and southwestern British Columbia, has been increasing almost every year since. Owing doubtless to the sunny summer weather, the beets yield well

¹⁹ These figures are from Prof. Bressman of the Oregon State Agricultural College. In 1909 the census reported 21,770 acres of hops in Oregon, but in 1919 the area had declined to 5,629 acres. The value of the 1930 crop amounts to several million dollars.



FIGURE 261.—Loganberry vines in bloom. Small fruits are one of the big crops in the North Pacific Region, and the loganberry, a cross between the California wild blackberry and a red raspberry, developed by Judge Logan of Santa Cruz, was, until recently, the leading bush fruit. It has a large berry the shape of a blackberry and the color of a dark red raspberry. The berry is now grown as extensively in the North Pacific as in the South Pacific Region, notable centers of production being around Salem and Gresham, Oregon, Puyallup, Washington, and the Saanich Peninsula on Vancouver Island, where this picture was taken. (Photo from British Columbia Dept. of Agric.)

and the sugar content is good. The average summer temperature in this Bellingham district is only about 60 degrees, whereas there is no other sugar beet district in the United States having a summer temperature below 65 degrees, so far as the writer knows, and in most beet districts the summer temperature is nearer 70 degrees.

Another agricultural industry of great importance in a few localities, mostly in the Puget Sound district, is the growing of Dutch bulbs. There are now probably 1,000 acres or more in narcissus, lily (largely "regal"), tulip, and other bulbs in the region, and the value of the crop ranges usually from \$1,000 to \$2,000 per acre. Several large firms have as much as 100 acres in bulbs (100,000 to the

acre), and most of the business is handled by not more than 25 firms. Many of the bulb growers are Dutchmen, who have moved to the United States to avoid the difficulties of tariffs and quarantines on bulbs grown in Europe. The United States Department of Agriculture has maintained for many years an experiment station for the industry near Bellingham, Washington.

The production of cabbage seed and beet seed has become an important industry near Mt. Vernon, Washington, and sweet pea seed is produced on several farms near Victoria, British Columbia.

PASTURES

The area of plowable pasture in the North Pacific Region is nearly half that of harvested crops and the acreage of non-plowable pasture (excluding woodland pasture), exceeds the acreage in crops. In addition there is a greater acreage of woodland pasture in farms than the total of all other kinds of pasture. The large extent of pasture in the region as compared with crops is owing principally to the climate, especially the long season in most of the region—yearlong in the valleys and along the coast of Oregon—and the frequent rains, except during the summer. Under such climatic conditions, during much of the year like those in western Ireland, pastures thrive; while the dry summers permit the curing of a hay crop for use when snow or excessive moisture interferes with the grazing. Since milk can commonly be produced on pasturage at less than half the cost of stall feeding, it is obvious that the pastures encourage dairying.

The plowable pasture is located mostly in the Willamette Valley and



FIGURE 262.—Celery field near Armstrong, British Columbia. This picture was taken outside the North Pacific Region, but it is so typical of the region as to crop and soil and scenery that its use seems justified. (Photo taken by Gus A. Maves, Shoal Bay Beach, Victoria, and provided by the British Columbia Dept. of Agric.)

in the California sections of the region, only about 15 per cent being found in the Washington portion, according to the census of 1925. One-third of the non-plowable pasture (excluding woodland pasture) is in the California coastal section and nearly another third in the Sierra of California, only 10 per cent being located in the Washington section of the region. Of the woodland pasture in farms, about 30 per cent is in the Sierra section, 30 per cent in the Willamette Valley, and only 15 per cent in western Washington. Nevertheless, there are as many dairy cows in the Washington sections of the region as in the Oregon sections, and nearly twice as many as in the

California sections. It is evident that in western Washington there is much greater dependence on crop feed, locally produced or imported, than in western Oregon and in the California sections of the region.

From 20 to 80 per cent of the pasture lands are seeded to tame grasses and legumes, the highest percentage being in the Puget Sound Basin and the lowest along the coast and in southwestern Oregon. Alsike and white Dutch clover, red clover, and blue grass are found in most mixed pastures of western Washington and the Willamette Valley. Native bent grass forms the basis for mixtures where the soil is moist and fertile throughout the season. Other common pasture grasses are the rye grasses, the fescues, orchard, brome, and "pine" grasses. The diked tidal and overflow meadows consist largely of the bent grasses and reed canary grass, a native marsh grass which is, however, very nutritious. Some of these lowland pastures will carry one or two cows per acre. Pure stand pastures, including sweet clover, are common in the Willamette Valley.

LIVESTOCK

The animal products of the North Pacific Hay and Pasture Region had a farm value of about \$82,000,000 in 1924,²⁰ as compared with feed crops having a value of about \$38,000,000. The expenditure for feed was nearly \$25,000,000, most of which was for mill feed and alfalfa hay from the east of the Cascade Mountains and from California.²¹ It seems probable

²⁰ Including an estimate of \$10,000,000 for the British Columbia portion in 1924, based on table in "British Columbia Manual," 1929, pages 82 and 83.

²¹ About 20,000 cars of hay pass over the Northern Pacific Railroad yearly at one point in western Washington, mostly alfalfa from the Yakima Valley and eastern Washington.

that the pasturage contributes fully half as much to the sustenance of the livestock as the crops grown in the region, and the contribution may be considerably greater. The value of the food crops (for human consumption) was nearly \$60,000,000 in 1924. About half of this consisted of fruit. After allowance is made for imported feed, it appears that livestock products produced on domestic feed and the food crops are of about equal value in the region.

Like New England, the North Pacific Hay and Pasture Region, except the Sierra section in California, is characteristically a dairying and poultry region, producing milk and eggs for the large city markets (Fig. 263). But unlike New England, it produces a large surplus of both. The surplus milk is made into butter and other dairy products, the butter going to California mostly and occasionally to the eastern consuming centers,²² while the condensed and evaporated milk and milk powder is shipped to mining and lumber camps, and to Alaska, Hawaii, the Philippines, and the Orient. The skim-milk powder is used by the bakery and confectionery trade, also to feed poultry; the casein is made into billiard balls and used for many other purposes.²³ The British Columbia portion of the region differs from the United States portion in being a milk deficit area. It imported dairy products to the value of \$4,-

²² Much of the butter sent east is packed in transit by the Land o' Lakes Coöperative Association in Minnesota and sold under its brand. Western Washington produces a larger proportion of 93 score butter than any other part of the United States.

²³ Some of the largest and best-equipped dairy plants in the country are in the Pacific Northwest. Single plants produce butter, condensed and powdered milk, cheese, and casein. One coöperative concern (United Dairymen's Association) does a business of \$10,000,000 to \$15,000,000 a year.



FIGURE 263.—The two great dairying areas of the Far West are the valleys of California, especially the Great Valley, and the corresponding longitudinal valley of western Oregon, Washington, and British Columbia. In the year 1924, the last year for which data are available, there were about 150,000 cows milked in western Oregon, 175,000 in western Washington, and probably 40,000 in southwestern British Columbia. Along the north coast of California there were about 75,000 cows milked, and in the Sierra section of the region about 25,000. The number of dairy cattle of all ages was almost twice as great. (Map from 1921 Yearbook, U. S. Dept. of Agric., with data added in southwestern British Columbia.)

400,000 in 1928, which is an amount one-third as great as the value of the local production. The imports are mostly butter from New Zealand. Doubtless some of the butter is consumed east of the mountains.

Dairy products constituted half of the total value of animal products in the region in 1924. The proportion, however, was two-thirds in the littoral sub-region; a half in the Puget Sound section, including southwestern British Columbia, also in the Willamette Valley; and only one-third in the Sierra sub-region in California. Nearly half of the milk in the region was produced in the Wash-

ington portion and nearly a third in the Oregon portion. Half of the milk in the British Columbia and Washington portions of the region and nearly three-fourths in the Oregon portion, apparently, was made into butter in 1924. There were 76 butter factories in western Oregon in 1928, but the number is diminishing owing to concentration into larger factories. The remaining half of the milk in British Columbia and western Washington provided the cities (Vancouver, Victoria, Bellingham, Everett, Seattle, Tacoma, and also Port-

operating in 1928,²⁴ in Grays Harbor County on the Washington coast, and in all the counties along the northern California coast.

There were about 425,000 dairy cows in the entire region January 1, 1925, according to the census, and the production of milk during 1924 was about 270,000,000 gallons, an average of 633 gallons, or 5,444 pounds per cow. But in western Washington the average production per cow was nearly 7,000 pounds, which was higher than in any other state in the Union, and in British Columbia it is

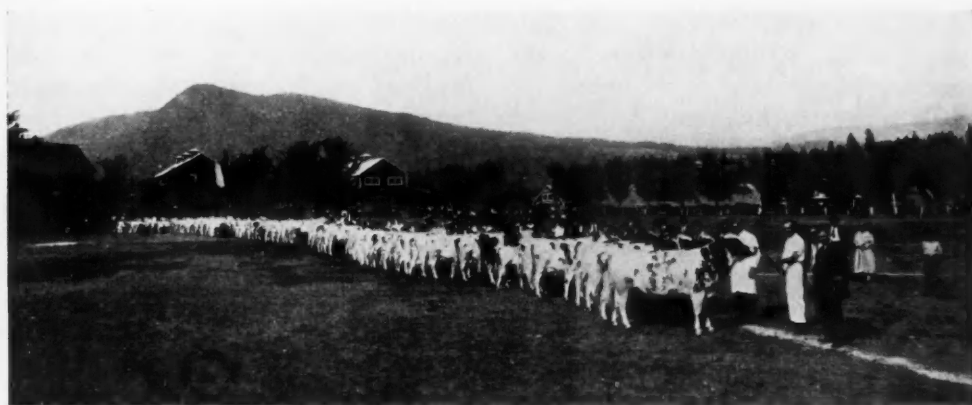


FIGURE 264.—One hundred and thirteen Ayrshire cattle in line at an exhibition near Armstrong, British Columbia, September, 1930. Ayrshires are a favorite breed in the North Pacific Region. (Photo from British Columbia Dept. of Agric.)

land in part) with milk, and, in addition, supplied milk processing plants, located mostly in the Puget Sound area. In western Oregon, where the urban population is smaller, there were 7 condensaries in 1928. In the northern California coast section there are 4 powdered milk plants (all in Humboldt county) and 3 condenseries, 24 creameries (7 in Humboldt county) and 34 milk-distributing plants, 21 of which, however, were in San Francisco. A large amount of milk is also made into cheese, mostly along the Oregon coast, where there were 50 factories

probably almost as high (Fig. 264). In the Sierra section, on the other hand, the production per cow was only about 5,000 pounds. The extent of the dairy industry in the region may be judged by the fact that from 60 to 80 per cent of the farms reported cows in 1925, the percentage being lowest in counties near the cities, where there are many fruit and poultry farms, and highest in the counties more remote.

Beef cattle are unimportant in the

²⁴ The annual sales of cheese at Tillamook, Oregon, total between 4,000,000 and 5,000,000 pounds, and at Marchfield the sales are about half as large.

region, except in the California section and the Rogue River Valley. In the Sierra section there were four times as many beef cows reported to the census as dairy cows, and in the Rogue River Valley twice as many. Over 50 per cent of the farms in the Sierra section had beef cattle in 1925, but less than 5 per cent in western Washington. Some of these beef cows are milked, but the proportion is small. There were about 145,000 beef cows in the region January 1, 1925, which is one-third as many as the number of dairy cows; but the production of beef did not exceed \$4,000,000 in farm value, as compared with \$40,000,000 for dairy products.

The sheep, likewise, are found mostly in the California portion of the region principally in the drier inland valleys of the coastal section and in the valleys of the Sierras. There are also a considerable number in the Willamette and Umpqua Valleys of Oregon. From 10 to 20 per cent of the farms had sheep in these California and Oregon Valleys, but only 2 per cent in western Washington. Many of the sheep are in the mountains during the summer season in California, but in Oregon they are mostly kept on the farms throughout the year. On some farms in Oregon the sheep are used in connection with Angora goats to clear cut-over land which has become overgrown with blackberry bushes, but the goats have been found to be much more useful for this purpose. There were about 120,000 goats in the Oregon sections of the region in 1925, over 30,000 in the California sections, and 3,300 in the Washington sections. The 750,000 sheep in the region on January 1, 1925, and others that had gone to slaughter, produced wool to

the value of about \$1,800,000 the preceding year; and it is probable that the lambs sold for almost \$4,000,000.

The swine, on the other hand, are found principally in the Willamette Valley and in the Puget Sound Basin, though there are a considerable number in the California coast belt and even in the Sierra. In western Washington much of the pork produced is raised in garbage feeding plants near the large cities. The value of the pork and lard produced by the 250,000 swine in the region in 1924 may have been as much as \$5,000,000. As little corn or barley is grown in the region, the hogs are fed mostly on oats, mill feed, and garbage supplemented by skim milk, which was formerly available in greater quantities than at present owing to the increasing sales of whole milk and decreasing sale of butter fat.

Last, but not least, are the poultry. There were nearly 8,000,000 chickens in the region January 1, 1925, and the farm value of the eggs produced the preceding year was nearly \$20,000,000 according to the census. In addition, the value of the chickens raised amounted to about \$8,000,000. Since 1925 the number of poultry have continued to increase. The poultry industry ranks second to the dairy industry in value of products, and its geographic distribution is similar, except that in the Puget Sound Basin and along the rivers, both on the coast and in the valleys, dairying seeks the lowlands and the poultry industry the uplands, a difference of five feet in elevation sometimes separating these industries.

Nearly half the chickens in the region are in western Washington—a larger proportion than of the dairy cows—and about a quarter are in

the Willamette Valley of Oregon, while a sixth are in the two California sub-regions. In nearly every county of the region from 75 to 90 per cent of the farms have chickens. In western Oregon the farms average 70 to 100 chickens per farm, whereas in the Sierra counties there are only half as many and in the Puget Sound district twice as many per farm. Since there are many small fruit and truck farmers in the Sound district which have only a few chickens, it appears that there must be many large poultry plants, and such is the case. In western Washington particularly, the industry is highly specialized. The eggs for hatching are often supplied by plants which select high-production, trap-nested hens and mate them with pedigreed cocks; the incubation is commonly done in large establishments; and sometimes even the chicks are brooded for several months in special plants before being sold to the poultrymen. After one year the hens are worn out, economically speaking, and are shipped to market for meat.

The surplus of poultry and eggs in the region is even greater relative to production than of milk. The Washington and Oregon sections of the region export eggs and poultry, shipping mostly to the large consuming centers in the Atlantic seaboard states.²⁵ Probably two-thirds of the eggs produced in western Washington are exported; but there were \$316,000 worth of poultry products imported into British Columbia in 1928. This is, however, only a fourth as much

²⁵ The Washington Coöperative Egg and Poultry Association handled nearly \$13,000,000 worth of eggs and poultry products in 1929, most from western Washington. This is, perhaps, two-thirds of the total production in western Washington. This association sold feed and other products that brought the total turn-over up to \$30,000,000.

as the value of imports a decade earlier.

There are a considerable number of ducks in the region and a few geese. The turkey industry is expanding rapidly, principally in the drier interior valleys.

Honey production is an important industry in the fruit districts especially. There were about 100,000 hives of bees in the region in 1920, which produced 2,500,000 pounds of honey.

The North Pacific Region is like New England in another respect—there are large numbers of farms without a horse or mule. Less than half of the farms in the counties containing large cities had horses or mules on January 1, 1925, according to the census. This is partly because of the large number of small fruit, poultry, and truck farms, and probably some small dairy farms also, on which it was cheaper to rent a horse, or pay for the plowing and cultivating of the parcel of land, than to keep a horse throughout the year. Many of the small fruit and truck farmers have small motor-propelled garden tractors with which they plow and cultivate the land. Even in such a general farming area as the Willamette Valley, only about two-thirds of the farms had horses in 1925, and the proportion is doubtless smaller today. Here a man having a tractor (regular 10-15 horse-power machine) often does work for his neighbors. There were, however, only 8,000 tractors in the region in 1929, according to the census, and there are probably less than 15,000 today. This is only one-fourth as many tractors as in the South Pacific region, which has not a quarter more farms. It is not clear why this great



FIGURE 265.—Nowhere is dairying more highly developed than in the North Pacific Region. The picture above is of a cow barn of the Brooksbank Laboratories, Ltd., located in the lower Fraser Valley near Vancouver, B. C. Certified milk is produced at this dairy. Note the window space, the concrete floor that is washed daily and the carrier supports for removing the bedding and manure. (Photo from British Columbia Dept. of Agric.)

difference should exist in the proportion of farms having tractors, but it may be owing in part to the fact that in the North Pacific region dairying is dominant, while in California fruit production is more important and highly commercialized, while there are also a large number of grain farms. More than half the tractors in the North Pacific region in 1925 were in the Willamette Valley (a general farming area), and nearly a fourth were in the Puget Sound and Cowlitz Valleys. From the north coast of Washington and Oregon only 400 were reported, but in the northern California coast counties there were nearly a thousand. In the mountainous Sierra sub-region it is surprising to find 300 tractors reported. The substitution of tractors for horses seems likely

to continue, for there are not half enough colts on farms in the region to replace the horses that die or become unfit for use yearly. This condition exists also in the South Pacific region, and, indeed, in nearly all parts of the nation.

SYSTEMS OF FARMING AND SIZE OF FARMS

Dairying is the dominant system of farming in most parts of the region (Figs. 265 and 266). The typical dairy farm in the Puget Sound Basin has 6 to 12 cows, producing in 1924 about \$100 worth of dairy products per cow. On such a farm there will be 8 to 12 acres of hay, mostly timothy and clover mixed and grain hay, 10 to 15 acres of oats, and, on a few of the farms 2 to 3 acres of corn cut for silage or fed



FIGURE 266.—Not all the cows in the region, however, are kept in such sanitary stables as those shown in Figure 265. This picture, taken in Marin County, California, is, perhaps, more typical of dairy farm equipment in the region. In general, however, the cows are better than are those shown above. (Photo from U. S. Bur. of Agric. Econ.)

green. More commonly roots (mangels, ruta-begas, and carrots) are grown instead of silage corn, particularly on the bottom lands. These root crops are well adapted to the climate of the region, and yields generally range from 15 to 50 tons per acre. Many of the dairy farms will have also an acre, more or less, of potatoes, grown partly for home use; and a larger proportion will have a home garden and an orchard of 15 to 20 apple trees, 5 to 10 pear trees and a similar number of prune (plum) and cherry trees. This farm is also likely to have one or two horses and from 50 to 150 chickens. On about one farm in 5 or 6 there will be found 4 or 5 swine. Nearly all the dairy farmers in this region buy feed, either hay or mill feed or both; the average expenditure per farm in 1924 was \$300 to \$500, varying with the county. On a third to half the farms there will also be an expenditure of \$200 to \$400 or more for labor. A third of the farms are clearing land at the average rate

of an acre or less a year, and as a result these farmers will have 10 to 15 cords of firewood to use or sell.

Most of the dairy farms in the Puget Sound Valleys have between 25 and 50 acres of land, nearly all cleared. These lowland farms frequently have 5 to 10 acres in pasture. The upland dairy farms may include as much as 100 acres, or even more, but a large proportion is logged off or stump land, most of which is used for pasture. Such farms were worth \$7,000 to \$12,000 in 1925, one-fourth of which was in the buildings and one-tenth in the livestock. The dwelling is usually worth \$1,500 to \$2,500, sometimes more (Fig. 267). The value of the land, excluding buildings, averaged fully \$100 per acre, which means about \$200 an acre for the cleared land.

Dairy farms in the Willamette Valley are similar to those in the Puget Sound area, except that there are still fewer cows per farm (5 to 10 usually) and the yearly value of dairy products per cow is smaller



FIGURE 267.—This is a typical house of the better type in the North Pacific Region. Note the small shed to the rear—fruit farms do not need large barns. (Photo by E. O. Wooton, U. S. Bur. of Agric. Econ.)

(\$60–\$90 in 1924). The area in hay per farm, 10 to 20 acres, is larger, however, than in the Sound district and clover is much more important than timothy and clover mixed. The acreage of grain hay is about as great as of clover. There is also a little larger acreage of oats per farm, and over a fourth of the farms grow corn, averaging 4 to 5 acres. In addition to the potatoes, garden, and orchard, there will be often 10 to 15 acres of wheat. The expenditure for feed is less than in the Puget Sound area, as might be expected because of the fewer cows and larger crop acreage, averaging only \$200 to \$300 per farm. Half of the farms also have an expenditure for labor, averaging between \$200 and \$400 per farm. In both areas there is also an expenditure averaging over \$100 per farm for lumber and posts.

In the northern portion of the Willamette Valley, the most frequent area of farms is 20 to 49 acres, but in the southern portions there are as many or more farms in the 50 to 99 acre, or the 100 to 174 acre groups. The acreage in pasture per farm, like that in crops, is consid-

erably larger in the Willamette Valley, especially in the southern portion, more remote from city influence, and nearly all the woodland in farms is pastured. The average value of the farms ranges from \$9,000 to \$14,000, varying with the county, which is somewhat more than in the Puget Sound area. The value per acre is about the same as in the Sound area (\$100) in the northern part of the Willamette Valley, but only half as much in the southern portion, where the farms average twice as large. About the same proportion of the farm land is cleared as in the Puget Sound area, a half to two-thirds.

The fruit farms are much more variable in size, ranging from a few acres to several hundred acres in trees. The few specialized prune farms, which are confined to the Willamette and Umpqua Valleys in Oregon and Clarke County, Washington, are commonly between 10 and 50 acres in size and have usually 1,000 to 5,000 trees. Many prune farms also produce other crops, and many general farms produce prunes. Apples are grown to a limited extent in the Puget Sound region and the

Rogue River Valley, as well as the Willamette Valley, but few specialized farms remain. These apple farms average, probably, a little larger than the specialized prune farms. The commercial production of apples has declined in the region and most of the apples are now grown in orchards on dairy or what might be called "general" farms. This is true also of pears, except in the Rogue River Valley, where there are several highly specialized pear farms, each containing thousands of trees.

The production of small fruits, on the other hand, tends to become more specialized. Typical small-fruit farms are small in area, often less than ten acres, but cultivation is intensive, and in the picking season a large amount of transient labor is required. This tends to cause such farms to locate near cities where boy and girl labor is available. Probably nowhere in the world has the production of small fruits been more highly developed than in Marion, Multnomah, and Washington counties, Oregon, and around Puyallup, Washington.

Specialized poultry farms are also characteristic of the region. In the United States portion of the Puget Sound Basin there were about 3,000,000 chickens reported by the census on January 1, 1925—almost as large a number as in Sonoma County, California, and many more than in Los Angeles County. As in California these chickens are mostly on highly specialized farms and are raised primarily for egg production. The farms are small in area, often only an acre or two, and nearly all the feed is purchased. The Willamette Valley has about 2,000,000 chickens, but the industry is not so specialized as in the Sound area.

In the Willamette Valley, in southwestern Washington, and elsewhere to a lesser extent, there are many farms which might be called general farms. Such farms in the Willamette Valley will contain usually between 100 and 300 acres of land, a third to a half of which may be wheat, oats, and hay and a third or a fourth in pasture. Such a farm will have several horses, 3 to 10 or more cows, 100 or more poultry, and frequently an apple or prune orchard. Such a farm will sell milk or butterfat, chickens and eggs, wheat, fruit, and sometimes oats and hay. Probably nowhere else, except in western New York, will there be found farms having a greater diversity of income than some of these general farms in western Oregon.

In the Sierra sub-region in California there are a number of typical cattle and sheep ranches, using the national forests for grazing in summer and the deserts to the east or the foothills of the Great Valley to the west in winter. Some of these livestock ranches have many head of cattle or of sheep and others relatively few—in most cases, indeed, too few to support a family in comfort.

Other systems of farming that deserve mention are the bulb farms of western Washington; the cabbage and beet seed farms in the Puget Sound Basin; the flower seed and cut-flower farms near Victoria, British Columbia; the hop farms of the Willamette Valley; and the fur farms. These are small in area but are highly specialized and produce commonly a very large value of product per farm.

Although there is a wide diversity in the system of farming in the region, a common feature is the smallness of the farms, especially in the north-

ern portion of the Willamette Valley, in western Washington, and in the British Columbia portion. The trend, moreover, appears to be toward still farther intensification and concentration of labor and capital on a small area of land. The United States portion of the Pacific Region is one of the few areas in the nation, outside the Great Plains region, that experienced an increase in number of farms between 1920 and 1925. In western Washington the number of farms increased from 23,948 in 1910 to 29,435 in 1920, and to 39,284 in 1925; in western Oregon the increase in number was from 31,586 in 1910 to 34,548 in 1920, and to 44,286 in 1925.²⁶ Even in the Sierra sub-

stores, or offices, but live on a small place along a good road and produce enough garden produce, eggs, and milk to qualify under the census definition of a farm as any place where farming operations produce \$250 worth of agricultural products or which exceeds 3 acres in size. There has been a large increase near the cities in many parts of the United States of these so-called "part time" or "amphibian" farmers since the World War.

Over half the farms in the North Pacific Region (56 per cent) are less than 50 acres in size (see Table I), but these farms contain only 12 per cent of the farm land, and about 20 per cent of the crop land. Nearly

TABLE I
NORTH PACIFIC HAY AND PASTURE REGION
NUMBER OF FARMS BY SIZE GROUPS
(United States, January 1, 1925; British Columbia, June 1, 1921.)

| Districts | Total | 0-9 | 10-49 | 50-99 | 100-174 | 175-259 | 260-499 | 500-999 | 1,000 |
|----------------------------|---------|--------|--------|--------|---------|---------|---------|---------|---------|
| <i>Valley</i> | | | | | | | | | |
| British Columbia..... | 10,265 | 3,638 | 3,483 | 1,249 | 1,374* | 224* | - | (297)* | - |
| Washington..... | 36,244 | 8,073 | 18,208 | 5,190 | 2,967 | 769 | 456 | 559 | 22 |
| Willamette and Umpqua..... | 36,588 | 4,773 | 13,032 | 6,356 | 5,346 | 2,187 | 2,039 | 2,662 | 193 |
| Rogue River..... | 3,281 | 423 | 968 | 557 | 648 | 205 | 194 | 259 | 27 |
| <i>Coast</i> | | | | | | | | | |
| Washington..... | 3,040 | 291 | 1,276 | 572 | 503 | 151 | 110 | 128 | 9 |
| Oregon..... | 4,017 | 277 | 863 | 752 | 1,023 | 315 | 331 | 419 | 37 |
| California..... | 6,823 | 539 | 1,991 | 869 | 1,016 | 390 | 564 | 1,018 | 436 |
| <i>Sierra</i> | 4,773 | 234 | 665 | 420 | 812 | 389 | 698 | 1,065 | 490 |
| Total..... | 105,031 | 18,248 | 40,486 | 15,965 | 13,689 | 4,630 | 4,392** | 6,110** | 1,214** |

* The Canadian classification above 100 acres is 100-200 acres, 200-300 acres, 300 acres and over.

** British Columbia is not included in these totals.

region in California the number of farms increased. The acreage of land in farms, on the other hand, remained stationary, in both western Washington and western Oregon, between 1920 and 1925, while in the California sections there was a loss of 250,000 acres.

Undoubtedly some of the increase in farms in 1925 over 1920 was owing to the greater number of part-time farmers who work in city factories,

²⁶ The 1930 census shows a slight decline in number of farms, but this is undoubtedly owing to a change in instructions to the enumerators concerning definition of a farm.

thirty per cent of the farms are between 50 and 175 acres in size. These medium-sized farms contain about 25 per cent of the farm land and 30 per cent of the crop land. Only about 15 per cent of the farms are over 175 acres in size, but these larger farms contain nearly two-thirds of the farm land, and about half of the crop land. As in the South Pacific Region, most of the farms are small, but more than half of the land is in the relatively few large farms. The land in these large farms, however, is generally of poorer

quality, and a smaller proportion is cultivated.

Agriculture in the North Pacific Hay and Pasture Region, like that in the Pacific Subtropical Crops Region to the south, is becoming urbanized. Many of the farms are scarcely more than good-sized suburban places. The mental attitudes and economic organization of the farm people, moreover, notably the specialized types of farming and development of coöperative marketing associations, have urban characteristics. As in California, much land has been sold by high-pressure salesmanship methods to people seeking an eldorado, but so long as the people keep coming, attracted by the mild winters and lovely scenery, as well as by the many amenities of a highly organized civic life, it is probable that land values will not decline materially. While most of the nation was experiencing a drastic decline in farm land values from 1920 to 1925, values continued to rise in the North Pacific Region, except in parts of the Willamette Valley and in the Sierra sub-region of California; and when the greater purchasing power of the dollar in 1925 is taken into account, it appears that values rose in these sections, also, in some counties notably. There are large numbers of people in the United States who have the means to live where they want to live—and it does not require very large means to do so. To such the climate and the scenery, the educational advantages, and the social life of the densely settled valleys of the Northern, as well as of the Southern Pacific region, make a strong appeal.

LAND TENURE

The majority of farms in the North Pacific Region resemble the

peasant farms of northern Europe not only in size but also in tenure. Three-fourths of the farms are operated by their owners (83 per cent in the British Columbia section). In addition, nine per cent of the farms are operated by part-owners, that is, by farmers who operate rented land in addition to the land they own. About five-sixths of the farms are, therefore, in reality, operated by owners. Only thirteen per cent of the farms are tenant farms and four per cent are operated by managers. The tenant farms constitute the smallest proportion of all farms in the mountainous Sierra section of the region (eight per cent). This is to be expected, as the income from mountain farms is usually too small to support both a tenant and landlord; moreover, farms in such districts tend to be self-sufficing in character. The highest percentage of tenancy is in the Northern California coast area, twenty per cent, possibly because of the large number of large farms—over a fifth exceed 500 acres in size. In western Washington and in the British Columbia area the proportion of farmers who are tenants is low—eleven per cent. In this section the farms are smaller than elsewhere in the region and most of them are devoted to dairying, to fruit growing, especially small fruits, and to poultry. Each of these systems of farming require a specialized knowledge and skill which tenants are unlikely to possess, and, in addition, the income from these farms is so small that it commonly suffices scarcely for the needs of one family. Moreover, most of this income is derived from the labor and investment in animals, and not from the land.

It is interesting to note that al-

though tenants constitute only 13 per cent of all farmers, they operate 19 per cent of the crop land, and that part-owners, who constitute only nine per cent of all farmers, operate 17 per cent of the crop land. Owners operate only 60 per cent of the crop land. Here, as in most northern states, the tenant who must pay rent in addition to supporting his family needs a larger farm than an owner-operator. Moreover, he is a younger man, on the average, and can work harder. The part-owner is usually more ambitious and capable than the tenant—is often an able tenant who has risen to part ownership—and he operates, in this region, twice as much crop land as the full owner. However, it may be that a larger proportion of the owner-operated farms are devoted to intensive types of farming—fruit and poultry principally—than are tenant and part-owner farms.

Between 30 and 50 per cent of the farms operated by owners, varying with the county, were mortgaged in 1925, and the ratio of debt to value ranged between 30 and 40 per cent. Much of this mortgage debt is the consequence undoubtedly of a surplus farm population in years past and the migration of many farm girls and boys to the cities, who, upon the parents' deaths, must be paid their share of the estate. This great drain on agriculture probably is about over in the North Pacific Region, and seems likely to cease before long in most other parts of the nation; for the birth rate of the farm population, though much higher than among city people, is falling almost as rapidly, and if the decline continues for a few years, there will be no surplus farm children to supply the cities.

THE PEOPLE

The total population of the North Pacific Hay and Pasture Region was about 3,160,000 in 1930. The farm population was about 400,000 in 1925, of which 346,059 were in the Washington, Oregon, and California portions and most of the remainders in British Columbia. In the United States portion of the region, excluding Alaska, there were 94,766 farms at the same date, according to the census. This gives an average population of only 3.65 persons per farm, as compared with 4.55 for the nation as a whole. Evidently there are fewer children, and, perhaps, fewer laborers also, on farms in this region than is generally the case in the United States.

This inference is confirmed by the number of children under 10 years of age, of which there were 69,000 on farms in the United States portion of the region on January 1, 1925, an average of less than three-fourths of a child per farm, as compared with one and a sixth for the entire United States. Either there are fewer children per family being born on these North Pacific farms than in most other regions, or the farmers and their wives are older and most of their children have gone to town to live. Probably both conclusions are true in part, but owing to lack of statistics on average age of farmers and also of birth statistics by residence of mother, the relative importance of the two factors in accounting for the very small number of children on farms cannot be measured.

Although everywhere in the region the number of persons per farm and the proportion of the population under 10 years old is small, there is

considerable difference in the several portions of the region. In the Willamette Valley there are only 3.4 persons per farm, and in the Rogue River Valley only 3.2 persons, as compared with nearly 4 persons in western Washington. The range in percentage of the population under 10 years of age is smaller—from 18 per cent in the Sierra of California to 22 per cent in the littoral counties of western Washington (see Table II). Apparently the farmers of western Oregon average older than those of western Washington.

In Table II it will be noted that the number of persons per farm on tenant farms in the North Pacific Region is similar to that for all farms in the United States. Tenant farmers, of course, average much younger than owner farmers; consequently, more children are at home. The inference is strong that the owner farmers in the North Pacific Region have a high average age, also that urban ideals or customs as to size of families have permeated the farm population of this region.

It is clear that there are not enough children on the farms in the

North Pacific Region to replace the farmers that die, and that, as in the South Pacific Region, dependence must be placed on immigrants from outside:

IMMIGRANTS

Less than one-third of the people living in the United States portion of the North Pacific Region in 1920 were born in the region. About a half were born elsewhere in the United States and a fifth were born in other countries (see Table III). About 35,000 residents came from New England, 45,000 from New York, and nearly as many more from Pennsylvania; nearly 50,000 came from Ohio, over 45,000 from Michigan, 35,000 from Indiana, and over 70,000 from Illinois; almost 60,000 from Wisconsin and 60,000 more from Minnesota. Iowa contributed about 75,000, Missouri 65,000, Kansas 35,000, Nebraska 30,000, and the Dakotas nearly 25,000. Over 50,000 residents of the region were born in the Rocky Mountain States, principally Montana, Idaho, and Colorado. The entire South and border states—15 states in all—contributed less than

TABLE II
UNITED STATES PORTION OF THE NORTH PACIFIC REGION

Farm Population, Population per Farm, and Proportion of Farm Population under 10 years of age, with similar figures also for Tenants, January 1, 1925

| Areas | Population on All Farms | | | | | Population on Tenant Farms | | | | |
|--------------------------------|-------------------------|--------------|----------------------|----------------------------------|--|----------------------------|--------------|----------------------|----------------------------------|--|
| | Total Number | Under Ten | Total per Farm | Under 10 Years per Farm | Per Cent Under Ten is of Total | Total Number | Under Ten | Total per Farm | Under 10 Years per Farm | Per Cent Under Ten is of Total |
| <i>Valley</i> | | | | | | | | | | |
| Washington | 140,296 | 27,686 | 3.9 | 0.76 | 20 | 18,279 | 5,338 | 4.6 | 1.35 | 29 |
| Willamette and Umpqua | 123,831 | 24,974 | 3.4 | 0.68 | 20 | 22,258 | 6,038 | 4.0 | 1.10 | 27 |
| Rogue River | 10,519 | 1,884 | 3.2 | 0.58 | 18 | 1,563 | 364 | 3.6 | 0.85 | 23 |
| <i>Coast</i> | | | | | | | | | | |
| Washington | 12,344 | 2,678 | 4.05 | 0.88 | 22 | 1,366 | 365 | 4.5 | 1.21 | 27 |
| Oregon | 15,205 | 3,094 | 3.8 | 0.77 | 20 | 2,742 | 721 | 4.8 | 1.25 | 26 |
| California | 25,080 | 5,266 | 3.7 | 0.77 | 21 | | | | | |
| <i>Sierra</i> | 18,712 | 3,422 | 3.9 | 0.79 | 18 | | | | | |
| Total | 345,987 | 69,004 | 3.7 | 0.73 | 20 | | | | | |

100,000 to the peopling of the region. Here, as in the South Pacific Region, it appears that the northerners have gone west (while the southerners have gone north).

In addition, there has been a large influx from Europe and a smaller migration from Asia. In the British Columbia portion of the region half of the 400,000 population in 1921 were Canadian born, nearly a third were British born, and slightly over a sixth were foreign born, half of whom came from the Orient. In the Washington and Oregon portions of the region, which are more typical than the California portions, 18.5 per cent of the 1,544,000 population in 1920 were foreign born. Less than a twelfth of these, or under 2 per cent of the entire population, was of Asiatic origin. About 60,000 residents came from Scandinavia, and over 16,000 more from Finland; 32,000 from Canada, 33,000 from Great Britain, and 10,000 from Ireland. Germany and Austria contributed 35,000, Switzerland over 6,000, Italy 10,000, Greece 5,000, Russia 13,000, and Poland 5,000. France, Belgium, and the Netherlands jointly sent 4,000, and 4,000 more came from Yugo-Slavia (see Table III). About half of these immigrants came before the year 1900 and half between 1900 and 1920. In British Columbia, however, only a fifth of the immigrants arrived before 1900.

Many of these immigrants in locating within the region have shown a preference for climatic conditions similar to those of their native land. Nearly 7,000 Finns have located in the moist littoral coastal sections of Oregon and Washington, where they are more numerous than any other foreign nationality. In this coastal belt the Swedes rank second in

number, the Norwegians third, and the Canadians fourth. In the drier valleys behind the Coast Range the Canadians rank first in the Puget Sound Basin, the Swedes second, the Norwegians third, the English fourth, and the Germans fifth; while in the warmer Willamette Valley the Germans are first, the Canadians second, Swedes third, English fourth, and Norwegians fifth. The Italians and French, and nearly all the Japanese and Chinese are mostly in the warmer valleys. This may be owing in part to the concentration of the Orientals in the cities, which may, in turn, be owing in part to legal restrictions on land ownership. It is doubtful, however, that many Oriental immigrants, any more than those from the Mediterranean countries, would live in the wet coastal belt even if opportunity were afforded.

EDUCATION

About 95 per cent of the children 7 to 13 years of age were attending school in 1920. This is a higher percentage than in most of the other states. Among the foreign-born school attendance fell below 90 per cent, but among the children of foreign or mixed parentage it was as high as among children both of whose parents were native born.

Nearly 25 per cent of the young people 18 to 20 years of age were attending school or college in Oregon in 1920, a higher percentage than in any other state except Utah, and nearly 22 per cent of such young people were attending school or college in Washington. By comparison it may be noted that in Massachusetts the percentage was 16, in New York 11.4, in Illinois 12.3, and in Georgia 11.7.

TABLE III
UNITED STATES PORTION OF THE NORTH PACIFIC REGION
Population, Persons per Family, and National Origin

| Area | Total Population 1930 | 1920 | Persons per Family, 1920 | Native White of Native Parents, 1920 | Foreign- Born White, 1920 | Indians (Amer- ican) 1920 | Japa- nese, 1920 | Chi- nese, 1920 | Persons Aus- tria | Can- ada | Den- mark | Eng- land | Fin- land | Born in France |
|-----------------------------------|-----------------------------|-----------|-----------------------------------|---|------------------------------------|------------------------------------|------------------------|-----------------------|-------------------------|-------------|--------------|--------------|--------------|-------------------|
| Valley | | | | | | | | | | | | | | |
| Washington..... | 994,726 | 844,954 | 3.9 | 401,619 | 178,378 | 1,251 | 13,417 | 2,213 | 4,426 | 30,177 | 6,193 | 15,353 | 7,286 | 1,637 |
| Willamette and Umpqua..... | 651,916 | 531,621 | 3.9 | 320,044 | 77,009 | 1,313 | 2,878 | 2,253 | 2,394 | 10,642 | 2,859 | 6,070 | 2,409 | 918 |
| Rogue River..... | 44,416 | 28,060 | 3.5 | 22,218 | 1,700 | 509 | 71 | 38 | 24 | 385 | 52 | 220 | 8 | 30 |
| Coast | | | | | | | | | | | | | | |
| Washington..... | 99,263 | 74,426 | 4.1 | 38,180 | 16,913 | 1,251 | 306 | 61 | 494 | 2,148 | 243 | 784 | 3,428 | 111 |
| Oregon..... | 74,481 | 63,206 | 3.8 | 35,925 | 11,012 | 3,720 | 445 | 356 | 115 | 879 | 352 | 552 | 3,404 | 88 |
| California (except S. F.)..... | 123,098 | 99,583 | 3.9 | 45,018 | 21,878 | 3,826 | 196 | 500 | 398 | 2,188 | 340 | 1,177 | 1,970 | 438 |
| San Francisco..... | 634,394 | 506,076 | 4.1 | 167,179 | 140,200 | 45 | 5,358 | 7,744 | 3,694 | 7,053 | 3,389 | 10,107 | 1,810 | 6,908 |
| Sierra | 85,314 | 70,558 | 3.5 | 38,358 | 11,597 | 2,163 | 109 | 404 | 446 | 694 | 160 | 924 | 80 | 242 |
| Total | 2,707,608 | 2,219,804 | 3.9 | 1,068,541 | 458,687 | 14,078 | 22,780 | 13,569 | 11,991 | 54,166 | 13,588 | 35,187 | 20,395 | 10,372 |

| Area | Ger- many | Greece | Ireland | Italy | Persons Jugo- Slavia | Enumerated in 1920 Nether- lands | Born in Norway | Poland | Russia | Scot- land | Sweden | Switzer- land |
|-----------------------------------|--------------|--------|---------|--------|----------------------------|--|-------------------|--------|--------|---------------|--------|------------------|
| Valley | | | | | | | | | | | | |
| Washington..... | 13,813 | 2,947 | 6,627 | 6,402 | 2,204 | 2,334 | 24,118 | 2,745 | 5,538 | 5,795 | 26,686 | 2,444 |
| Willamette and Umpqua..... | 10,967 | 1,175 | 2,811 | 3,774 | 790 | 595 | 4,877 | 1,311 | 6,484 | 2,673 | 8,064 | 3,364 |
| Rogue River..... | 329 | 11 | 82 | 20 | 8 | 11 | 48 | 12 | 21 | 84 | 172 | 46 |
| Coast | | | | | | | | | | | | |
| Washington..... | 919 | 698 | 308 | 478 | 733 | 55 | 1,658 | 627 | 518 | 248 | 2,195 | 275 |
| Oregon..... | 763 | 339 | 256 | 144 | 255 | 43 | 1,354 | 87 | 208 | 208 | 1,218 | 405 |
| California (except S. F.)..... | 1,848 | 216 | 1,308 | 4,190 | 245 | 118 | 711 | 157 | 223 | 389 | 1,322 | 1,240 |
| San Francisco..... | 18,513 | 3,204 | 18,257 | 23,924 | 1,320 | 788 | 2,121 | 2,152 | 5,752 | 3,569 | 6,468 | 2,806 |
| Sierra | 923 | 349 | 519 | 3,481 | 264 | 46 | 162 | 37 | 106 | 170 | 422 | 33 |
| Total | 48,075 | 8,939 | 30,168 | 42,413 | 5,819 | 3,990 | 36,049 | 7,128 | 18,850 | 13,136 | 46,547 | 10,613 |

There are thirteen institutions of college or university grade in the region, eight in Oregon, two in Washington, two in British Columbia, and one in Alaska; while the University of California at Berkeley and Stamford University at Palo Alto lie near its margin. In the thirteen institutions in the region, there are about 20,000 students, nearly half of whom are in the University of Washington at Seattle. In the two state institutions of Oregon, the University of Oregon at Eugene, and the State Agricultural College at Corvallis, there are over 7,000 students, about half in each institution; and in the University of British Columbia, at Vancouver, there are about 2,000 students, with 200 more in the affiliated Victoria College at Victoria. A territorial

College of Agriculture and School of Mines has recently been established at Fairbanks, Alaska, which has about 100 students. The College of Puget Sound at Tacoma has about 400 students. Other higher education institutions, all in Oregon, are Reed College at Portland (500 students), Albany College at Albany (100 students), Linfield College at McMinnville (250 students), Pacific College at Newberg (150 students), Pacific University at Forest Grove (300 students), and Willamette University at Salem (600 students).

In addition there are a large number of students, particularly from the California sections of the region, attending the University of California and other schools in that state; while many students from the region are in eastern universities. On the other

hand, many students from eastern Oregon, Washington, and British Columbia are attending the state universities and other schools in the North Pacific region. Of the 200,000 young people, more or less, 19 to 23 years of age inclusive, in the region, excluding the California sections, about one in ten are in college or university. This is a higher ratio than in almost any other part of the United States, and many fold greater than that in any country of Europe.

Illiteracy

Only 34,000 people in the United States portion of the region, or 1.5 per cent of the population 10 years of age and over, were unable to read and write in 1920. This is a smaller percentage than in any state to the east except Idaho, Nebraska, and Iowa, and is in sharp contrast to 5 per cent in New England and New York, or 10 to 20 per cent in the Southern States. But, for the native-whites of native parentage, also for native-born of foreign or mixed parentage, the proportion was only about 0.3 per cent, whereas for foreign-born the proportion was about 5.0 per cent, and for the negroes in the region it was nearly as high. The efficiency of the public schools in reducing illiteracy is clearly shown in these figures. It should be noted, however, that about one person in four of the American Indian and Chinese residents of the region was illiterate in 1920, and one in eight among the Japanese. Many of the Orientals arrived in the United States too old to enter the public schools, and probably many of the Indians were grown up before the reservation school system developed (Fig. 268).

RELIGION

About 450,000 people in the Washington and Oregon portions of the region were members of a church in 1926, or about 30 per cent of the total population.²⁷ Of the population over 13 years of age, the percentage is only a little greater. Nearly 30 per cent of the church members are Catholics, and over half of those under 13 years of age. The Methodists are the leading Protestant denomination, with a membership of 65,000, about half that of the Catholics. The Presbyterians are two-thirds as numerous as the Methodists, and the various Lutheran bodies aggregate almost as large a membership as the Presbyterians. The Baptists and Disciples of Christ each number half as many as the Methodists. There are over 20,000 members of Jewish congregations, and almost as many members of the Congregational church. The Protestant Episcopal membership is also about 20,000. Adventists number nearly 10,000, Mormons about 8,000, and Christian Scientists 6,000. There are 20 other denominations listed in the census, besides about 50 churches classified under the heading "All other denominations," but none of these had over 5,000 members.

In British Columbia, on the other hand, the Protestant Episcopal communicants, or "Anglicans," are most numerous, constituting about 30 per cent of the total population in 1921, followed by the Presbyterians who composed 25 per cent of the popula-

²⁷ This statement, and those that follow, are based on the assumption that the ratios to total population are the same in western Washington and Oregon as in the states as a whole. Since about 80 per cent of the people of Oregon live in the North Pacific Region, and nearly 70 per cent of the people of Washington, the error cannot be large.

tion. Methodists and Catholics each included about an eighth of the population, and "Eastern Religions" a sixteenth. Baptists and Lutherans each numbered about 15,000 or 4 per cent of the total population. No other religions included more than 3,000 persons. In the Canadian census nearly every person is classified under some religion, an interesting contrast to the 70 per cent of the population in Washington and Oregon not members of a church. However, the difference, probably, is more nominal than real.

THE NEW MIGRATION

In low rate of illiteracy, in high rate of school attendance, and in proportion of young people in college or university, the North Pacific Region ranks above all other parts of the United States, except, possibly, the Western Corn Belt and the Mormon commonwealths of Utah and Idaho, and except California with reference to students in colleges and universities. In the large number of communicants of the Presbyterian, Congregationalist, Unitarian, and Christian Science churches, denominations which emphasize the intellect more than the emotions, the North Pacific Region resembles that former Puritan civilization that extended from New England through New York and Ontario to southern Wisconsin and Kansas, and which still persists in many of the rural villages and college towns of the Northeastern and Great Lakes states. Moreover, like this northeastern Puritan civilization that is passing away, the North Pacific Region has a very low birth rate. The birth rate in Washington, 14.6 per 1,000 population in 1929, and Oregon, 14.1, is lower than in any other state except Nevada (14.2).



FIGURE 268.—Coast Indians in ceremonial dress. There were 14,000 native Indians in the United States portion of the North Pacific Region in 1920, and as many more in the British Columbia portion. Some live on reservations, others on farms, and a few work in the cities. The white settlers found the Indians of the North Pacific Coast peaceable, gaining their livelihood largely by fishing rather than hunting, and that they were especially fond of ceremony and ceremonial dress. The art exhibited in this dress and in their totem poles is of high quality. (Photo taken at Prince Rupert by Harold Fleming, Victoria, B. C., and furnished by British Columbia Dept. of Agric.)

In no other state except California, where the birth rate was 14.8 in 1929, is the birth rate below 17. At the present expectation of life, about 59 years, it requires about 17 births per thousand population each year to maintain permanently a stationary population without immigration.²⁸

Yet, the population of the United States portion of the North Pacific Region increased from about 2,220,000 in 1920 to 2,708,000 in 1930, which is a gain of 22 per cent. This is a greater increase than the average for the United States as a whole. The Puritan civilization is passing away, but other people like to live, apparently, where it persists, especially the northern European peoples. The children of these European immigrants, however, have acquired not only the Puritan's insistence on edu-

²⁸ The expectation of life of a new-born child in the United States is unlikely ever to be above 63 years, possibly 65 years.

cation, but also his deficient birth rate; consequently, a new immigration must be induced, if population and prosperity are to advance.

The commercial interests of the North Pacific coast have learned how to attract home seekers (possibly from their neighbors to the south), and nearly every transcontinental train brings a few people who will settle sooner or later in or near some city in this region of mild winters and snow-capped mountains. However, unlike the first migration of Puritan pioneers, who came across the desert in covered wagons, strengthened by their determination to erect a civilization in the wilderness, and unlike also the later migration of Scandinavian, Finnish, German, and British immigrants, most of whom brought little more than an ambition to better their economic condition and a willingness to work, the present migrants into the North Pacific Region come in Pullman cars, and in lieu of horny hands bring several thousand dollars of capital.

The North as well as the South Pacific region is becoming a great consuming center into which flows income from industries and farms located in all parts of the United States and Canada. Not many of its residents are very rich, but there are a large number of middle-class people, so-called. Some have retired and are living on their income, but more are actively engaged in all sorts of business enterprises. Still more numerous are the small property-tied proletariat (if the contradiction in terms may be permitted)—factory employees, artisans, and clerks in stores and offices. Thousands of these find it pleasant or profitable, or both, to live on a little place outside the city proper, but along a good

road, and raise enough fruit, vegetables, poultry, and eggs for home consumption during much of the year, possibly even keep a cow and a pig and sell a small surplus of fresh products to neighbors or friends in the city.

The automobile and the tractor are having a profound effect on American agriculture, and the automobile is making more small farms than the tractor is making large farms. Between 1920 and 1925 the number of farms in the United States under 10 acres in size increased 31 per cent, and farms 10 to 19 acres in size increased nearly 16 per cent; whereas the number of farms in all larger size groups decreased. In the Pacific States the increase in number of farms under 10 acres in size was 54 per cent, and of farms 10 to 19 acres in size was 40 per cent.²⁹

A shift in the geographic distribution of population in the United States is in progress. The people are moving from both the city and the farms into the suburbs, until metropolitan centers are, in many areas, joining up along the principal highways. In the wheat-growing regions of the central west, small farms are being consolidated into large farms and large farms into still larger. The corn harvester seems likely to induce such a trend in the Corn Belt.³⁰ Some of the most fertile farming districts in the nation are being depopulated—farmhouses and schools are empty and many of the small villages are declining. The young people, some of the middle-aged

²⁹ Owing to a change in instructions to census enumerators, the number of farms in 1930 in regions where part-time farming is common is not comparable with preceding censuses.

³⁰ If the cotton picker should be successful, this shift would extend into the Cotton Belt also.

people, and a few retired farmers are moving to the towns and the suburbs of the cities, notably those of the Northeastern, the Great Lakes, and the Pacific states. The farm population of the nation as a whole has declined over 10 per cent since the World War. It is a significant migration, but its full meaning is not yet clear.

NOTE.—The author is indebted to W. A. Schoenfeld, representative of the Federal Farm Board at Portland, Oregon, for many items of information contained in this paper concerning the livestock industry of the Pacific Northwest; to J. T. Jardine, Director of the Agricultural Experiment Station at Corvallis, Oregon, and his colleagues, particularly M. L. Nelson, E. N. Bressman, and C. V. Ruzek, for items of information and also for valuable criticism; to George Severance, State College of Washington at Pullman, and to his associates for valuable suggestions, particularly for information on the development of the sugar beet industry near Bellingham, Washington; and finally, to David Griffiths of the U. S. Bureau of Plant Industry for data on the bulb industry of western Washington.

OUR GROWING SYSTEM OF INLAND WATERWAYS

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MERCHANDISE in transportation within the country must move in four ways: by railroad, by motor trucks, by airplane or aircraft, or by boats and barges. This is axiomatic.

At the present time there is a renaissance in this latter method of transportation. It is the oldest and newest way of moving goods. The last few years have seen the romance of Mark Twain days on the Mississippi replaced by modern methods that include large traffic tonnage, bulk freights, and engineering plans which entail great expenditures. The songs of "steamboatin' days" are drowned by the scraping of locks and the sounds of the docks.

In a compilation of inland waterway freight lines just concluded by the Transportation Division of the U. S. Department of Commerce, there was recorded 200 common carriers, 98 contract carriers, and 187 private carriers operating on the inland waterways of the United States. These companies own approximately 4,500 barges and 1,300 units of propelling equipment, with a total value of 150 million dollars.

During 1929 the shipyards of the country constructed 410 barges and 49 units of propelling equipment for inland uses. During 1928 there were constructed 321 barges and 22 units of propelling equipment. Such figures show the steady growth in the building and demand for increasing river transportation needs.

The development of waterways inland has become progressively more active during the last ten years, since the war emergency shoved water transportation into sudden, though limited, use. Recent developments are (1) channel improvements on the Mississippi and Ohio Rivers; (2) the imminence of the formal opening of the Welland deep canal connecting Lake Erie and Lake Ontario through Canadian soil; and (3) the prospect of an early move by the Canadian Government looking to further progress on the St. Lawrence route, which would let ocean vessels penetrate to the Great Lakes.

Contemplated developments include the items in the new rivers and harbors bill in Congress, the first general extension program since 1927. This provides for taking over the Erie and Oswego Canal system by the Federal Government from New York State. The bill has been passed by the House and awaits action by the Senate. The enthusiastic support of inland waterway projects by the Hoover Administration is significant. The current reëxamination of waterway policies by organized business as represented by the Chamber of Commerce of the United States indicates a renewed interest.

The nation is committed to a program of extensive construction of river and canal waterways which will continue through this decade and indefinitely beyond, the cost running upward from \$65,000,000 annually.

The results are likely to be the gradual and moderate development of new routes for domestic trade, marked stimulus to certain trade and industrial centers. The direction of the movement may shift from time to time due to public thought and political policy, but the momentum of the waterways movement is definitely increasing.

not strictly comparable to other inland waterways, since these large seas are but "an arm of the ocean," is the Mississippi River with its tributaries.

The main trunk is from New Orleans to Cairo, the junction with the Ohio River. Other trunks are the Ohio River, which runs to the Pittsburgh industrial region, some-



FIGURE 1.—The sites for suitable and convenient waterway terminals are not everywhere easy to choose, but along the Mississippi there are few places where any serious difficulty on this score is encountered. Even at St. Paul, near the headwaters of navigation where this terminal has been constructed, no serious obstacles stood in the way of a satisfactory terminal. (Courtesy of Inland Waterways Corp.)

NATIONAL WATERWAYS SYSTEM

What are the systems of inland waterways for the United States? First, in point of actual, practical current use are the Great Lakes, which constitute the most traveled inland seas of the world. An outlet for them is found in the St. Lawrence River and the New York Barge Canal and the Hudson River.

Vying with the Great Lakes System, which its proponents declare is

times called the "Rhine of America"; the route via the Illinois River and canals to Chicago and the Lakes; the further extension to St. Paul and Minneapolis; the Missouri River to Kansas City, and later to Sioux City and beyond. There are other feeders in the Tennessee River affecting both western and eastern Tennessee and northern Alabama; the Cumberland River through northern Tennessee and the Arkansas and the Red Rivers.

Following the Great Lakes outlets

and the Mississippi in national importance is the Intracoastal Waterway which skirts the Atlantic Coast inland, thus protected against the uncertainties of the ocean. This runs from Boston to New York, to Philadelphia, to Norfolk, to Beaufort, North Carolina, thence to Florida, and eventually it is planned to reach the Gulf to Mobile, New Orleans, and on to Corpus Christi, Texas. This waterway is the least completed of the great national waterway systems, but is in use between Boston and Beaufort except for the thirty-mile "bottle-neck" canal across New Jersey. The canal from New Orleans to Corpus Christi is well on the way to completion.

As a future dream, it is ultimately planned by the inland waterways proponents to complete a belt line around the whole eastern half of the United States. This would run from the Great Lakes by way of Chicago to New Orleans; by the coast around to New York, by the Hudson River and New York canals to the Great Lakes, or through the St. Lawrence by way of Lake Champlain.

Of more localized importance for individual areas of the nation are the short rivers running into the Atlantic and the Gulf and the Pacific. These are useful in their regions. The Warrior River from the Birmingham industrial region to Mobile is considered a feeder to the Mississippi and intracoastal units. Similarly related is the Alabama River, still in the project stage, the route reaching from Mobile, northeastern Alabama, and Rome in the Georgia northwest region, draining these industrial areas. The Apalachicola and Chattahoochee Rivers are marked for improvement from Columbus, Georgia, to the Gulf.

On the Pacific Coast are two main waterway projects. The Columbia and Snake Rivers in Washington and Oregon and entering Idaho, and the Sacramento and San Joaquin Rivers with outlet at San Francisco.

As for depths, the main Mississippi trunk and the Ohio are now nine feet.

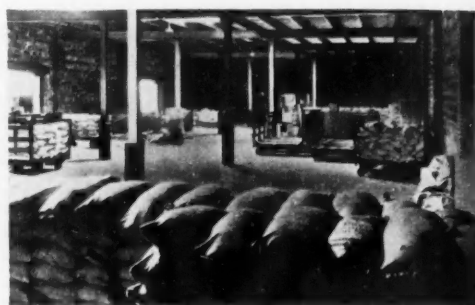


FIGURE 2.—Goods in the Minneapolis terminal awaiting barge shipment down the Mississippi. Great quantities of bulky goods, for which the delivery does not require haste, are moved by the river route. (Courtesy of Inland Waterways Corp.)

The waterway from Chicago to New Orleans is to be nine feet. The principal other Mississippi tributaries are to be six feet at first and more later. The New York Barge Canal is twelve feet. The Intracoastal Waterway is to be twelve feet. The St. Lawrence channel is to be twenty-seven feet; the Welland Canal is thirty feet.

PRESENT DEVELOPMENT AND FUTURE PLANS FOR INLAND WATERWAY NAVIGATION

The outstanding event in the inland waterways development during 1929 was the completion and formal opening in October of the Ohio River to nine-foot navigation from Pittsburgh to the Mississippi River at Cairo, Illinois. This event marked the completion of a project which was begun almost half a century ago, and which provides a thousand-mile waterway through one of the richest



FIGURE 3.—Great fleets of long barges and huge scows may be moved at small cost with relatively little power downstream, and unless quick delivery is demanded, this is one of the most economical ways of transporting bulky goods. (Courtesy of Inland Waterways Corp.)

sections of the United States. Few other parts of the country furnish as nearly ideal conditions for a highly developed river commerce as does that portion traversed by the Ohio. There are found vast quantities of the basic bulky commodities, and steadily developing manufacturing industries, which produce commodities well suited to river shipment. Commercial leaders have envisioned a great industrial development in the Ohio Valley as a result.

During the past few years physical developments on the Mississippi system of waterways have progressed to the point where there is now a nine-foot channel connecting Pittsburgh with New Orleans. Work is continuously in progress by the Government to maintain a six-foot channel on the upper section of the Mississippi from St. Louis to Minneapolis and St. Paul.

As a result of extensive hearings

held last April before the Board of Engineers for Rivers and Harbors, a comprehensive survey is now in progress by Army Engineers for the purpose of determining, among other things, the cost and economic justification of a nine-foot channel in this section. About 2,000 miles have been improved to nine feet in depth, and approximately 1,400 miles have been improved to at least six feet in depth. It is the plan of the present administration to increase the shallower depth to at least nine feet as fast as traffic justifies it.

Substantial progress has been made during the past year in the development of a six-foot channel in the Missouri River as far as Kansas City, with plans for subsequent channel improvement of the section above Kansas City.

Present plans provide for a nine-foot waterway from the Mississippi River at Grafton, Illinois, thirty-

eight miles above St. Louis, to Chicago, via the Illinois River, the Illinois and Michigan Canal, the Des Plaines River, the Sanitary District Canal, and the Chicago River. Completion will be within a year and a half. This will provide a nine-foot



FIGURE 4.—Most of the terminals for barge transportation are equipped with modern machinery for handling goods expeditiously and without loss. The quantity of wares shipped by waterways is indicated by the large amount stored in this terminal at Birmingham, Alabama. (Courtesy of Inland Waterways Corp.)

channel from New Orleans to Chicago.

This past year saw 700 miles of the Intracoastal Waterways completed, leaving approximately 1,000 miles to be constructed, which is planned to be completed within ten years. Plans are underway to eliminate the "bottleneck" privately owned Delaware and Raritan Canal across New Jersey because of its insufficient depth and equipment, by a new canal. The waterways, among others, embraced in this system are the Cape Cod Canal, the Chesapeake and Delaware Canal, the Chesapeake and Albemarle Canal, and the Dismal Swamp Canal.

During the year, work was begun upon the extension of the waterway from Beaufort, North Carolina, to Cape Fear River, and the Army Engineers have reported favorably upon the eight-foot depth carrying

the waterway from Cape Fear River to Charleston, South Carolina. Another progressive step of the year was the acquiescence of Florida in the Federal terms for the taking over and deepening to eight feet of the Florida East Coast Canal and waterways extending south from the St. John's River.

Special attention is being given to surveys anticipating the further development of certain tributaries of the Ohio and Mississippi Rivers, of such streams as the Alabama, the Coosa, the Chattahoochee, the Apalachicola, and others. Surveys have been completed and others are in progress.

On the Pacific Coast a survey by Army Engineers is in progress for determining the tonnage available for steamers and barges operating between Portland, Oregon; Pasco, Washington; Lewiston, Idaho; the cost of providing terminals; and type of equipment best suited for the Columbia and Snake Rivers. This survey is nearly completed.

Dr. L. P. Nickell, Inland Waterways Section, Transportation Division, U. S. Chamber of Commerce, says that "there is every indication that 1930 will show even greater progress than was made in 1929 in the development of navigation on our inland waterways."

The total mileage of rivers classed as navigable is 25,000 miles, but only about 4,000 miles of rivers and canals are now in the best condition for use. Some conservative authorities reduce the figure by including only rivers having channel depths of reliable constancy.

WATERWAYS TRAFFIC DEVELOPMENT

Complete figures are not yet available for 1929 as to traffic on inland

waterways, but special estimates made by the Transportation Division of the U. S. Chamber of Commerce indicate that the year will show a substantial increase over 1928. The latest complete statistics are for 1928. According to the Annual Report of the Chief of Engineers, U. S. Army, 1928 showed an increase over 1927 in the commerce carried on our rivers, canals, and connecting channels. The figure for 1928 was 227,300,000 tons, as compared with 219,000,000 tons for 1927. These figures include traffic through St. Marys Falls Canal and the Detroit River.

Steady growth made in inland waterway traffic since 1922 is indicated by the following table:

COMMERCE ON THE RIVERS, CANALS, AND CONNECTING CHANNELS OF THE UNITED STATES, CALENDAR YEARS 1922-1928

| Year | Tonnage |
|-----------|-------------|
| 1922..... | 111,800,000 |
| 1923..... | 153,700,000 |
| 1924..... | 173,200,000 |
| 1925..... | 204,569,000 |
| 1926..... | 217,000,000 |
| 1927..... | 219,000,000 |
| 1928..... | 227,300,000 |

Waterway transportation has generally been considered best adapted for such commodities as coal, iron, steel, cement, sand and gravel, forest products, ores, and other bulky commodities with which time in transit is not a particularly important item, with which terminal handling costs are less important factors than in the case of high-class package freight.

Thus far, however, few inland waterway terminals have been designed and built at which handling costs are not excessive, according to students of the problem. The terminal costs today for handling of the higher class of freights constitute from 50 to 60 per cent of the total transportation costs. The handling costs for the bulky commodities are much lower than this figure.

BULK FREIGHT ADAPTED TO WATERWAYS

It is bulk freight of low unit value which is adaptable to transportation by inland waterways—commodities that do not require speed, and which



FIGURE 5.—Copper ingots from Chile consigned to St. Louis are being transhipped from the ocean-going steamer to the river barge at the dockside in New Orleans. Such heavy material as this can most conveniently and economically be shipped by water. (Courtesy of Inland Waterways Corp.)

can be handled mechanically. Examples of this are the following: wheat from Duluth to Buffalo; iron ore from Lake Superior to Chicago, Cleveland, and Pittsburgh; limestone from northern Michigan, and coal from Cleveland and Toledo to Duluth; anthracite from Pennsylvania to Ontario and New England; heavy iron and steel products from the Pittsburgh region down the Ohio and Mississippi to New Orleans; coal down the Monongahela to keep the Pittsburgh region's steel business running; wheat down the Mississippi to New Orleans for export (mainly in the future); gasoline from Oklahoma (the New York State system also is of prime importance for distributing gasoline throughout the State). Other examples are lumber up the Mississippi from Louisiana; bauxite,



FIGURE 6.—Steel and cast-iron pipe, heavy and bulky, lends itself to satisfactory transport by river barges. Like coal and ore, it usually does not demand quick delivery, and when time is not the chief element in the transport, the waterway is eminently desirable. (Courtesy of Inland Waterways Corp.)

the crude material for aluminum, from Arkansas to East St. Louis; sulphur from Texas to all parts of the East; sugar from New Orleans to the interior; coffee and spices, vegetable oils, and other imported agricultural products up the Mississippi; and iron, steel, and coal down the Warrior River from the Birmingham district, thence for export, or to other inland waterways. Now automobile parts are beginning to move on the Mississippi, the one significant example of use of water for hauling higher grade products.

Inland water transportation has worked best to date in cases where there is one large shipper and one large consignee, or with modifications of this condition. Miscellaneous and irregular shipments do not go much by water, although they may change as there is a growth of water common carriers, which now are few.

THE OHIO RIVER TRIBUTARIES AN EXAMPLE

In the revitalization of our waterways the Ohio River and its tributaries have been held in the forefront. The Ohio and the Monongahela have

proven since 1920 their value for the transportation of the bulky commodities, as they had proven earlier in the heyday of water transportation.

Records of the War Department, Engineer's Office, show that the traffic on the Ohio declined to four and one-half million tons, the greater part of which was coal, transported relatively short distances. This figure was the lowest reached since 1890. However, within a decade, by the end of the fiscal year ending June 30, 1928, the traffic had grown to almost 21 million tons, an increase of 345 per cent. There has come a greater diversification of commodities handled and a greater ton mileage. The ton mileage in 1928 amounted to 1,344,687,000. There has also been a substantial increase in the average haul of the total tonnage.

Some commercial leaders have seen the possibilities of a closer relation between the development of the Ohio and Mississippi River systems and our trade with Latin American countries. The states bordering the Ohio furnished large quantities of our exports last year and the percentage might increase, it is believed, with

utilization of the river as a means of transporting the heavier products to the seaboard. The people in the Ohio and Mississippi valleys produce annually large quantities of commodities which Latin America needs, and likewise need large quantities which they produce.

From a traffic standpoint the chief inland systems stand as follows, using the figures for 1928:

| | Tons |
|--------------------------------|------------|
| Monongahela into Pittsburgh... | 27,500,000 |
| Ohio..... | 21,000,000 |
| Lower Mississippi..... | 4,448,000 |
| Erie Canal..... | 3,000,000 |
| Hudson River..... | 10,000,000 |

These figures, without intricate explanation of allowances for local traffic, duplication, and foreign traffic, serve merely to give a general survey of the rank of the chief waterways.

NEED OF JOINT RAIL-WATER TRAFFIC AGREEMENTS

For continued growth of waterways there is the necessity for the provision of adequate public river-rail terminals. As shown by recent research conducted by the Transportation Division of the U. S. Department of Commerce, the principal modern terminals on the Ohio River, between Pittsburgh and Cairo, are owned by private companies, and are not suitable for the general public. There is encouragement in the fact that within the past year more interest has been displayed in the provision of public rail-river terminals.

Of equal importance is the question of joint traffic rates between rail and water carriers. In the past, with few exceptions, litigations have been necessary for the effecting of joint rail and water routes and rates. But, few agreements have been reached.

Progress has been made toward the solution of this in the passage of the Dennison Act, which provides, among other things, for the establishment of joint rates and through routes between rail carriers and the Inland Waterways Corporation. While this particular legislation deals specifically with the corporation named, it provides that a water line may apply to the Interstate Commerce Commission for a certificate of public convenience and necessity, which, when granted, carries with it a mandate to the Commission to fix joint rates and suitable division of revenue between the water line and all rail carriers connected with its terminals.

If waterways are to reach their fullest development, there must be a free interchange of traffic between them and suitable physical connections. Traffic originating on any railroad can be delivered to a consignee on any other road of standard gauge in the United States, and traffic is freely exchanged between various lines. The same economic principles apply to carriers via inland waterways, especially to rail and water interchange.

FOREIGN INLAND WATERWAYS SUGGEST POSSIBILITIES

It is interesting to note in any study of inland waterway transportation the use that foreign industrial nations are making of their own rivers and canals. Necessarily conditions abroad differ from those in the United States, but some fundamental principles in inland water transport are common to both the United States and European countries.

Experience in connection with the Rhine and other systems of north and

central Europe show that the transportation of the heavier bulk and low-grade commodities is successful.

Germany has had generations of experience with this medium of transportation, and accordingly has been successful in her operations. There are many German cities which have become great manufacturing centers because of waterways development, for example, Duisburg, Mannheim, and Ruhrort. The German Government has spent hundreds of millions of dollars on the development of its waterways.

The mileage of waterways in Germany, including canals, amounts to 7,635 miles. Including barges and towboats, the German inland fleet numbers 25,000 vessels of a total tonnage exceeding 7,000,000 tons. Inland ports have been built which rival the proudest seashore, Duisburg-Ruhrort, ranking first with an outgoing and incoming traffic by water in 1928 of 22,777,000 tons. In 1928, 107,600,000 tons of freight were carried by German inland waterways.

The maritime status of Belgium is disclosed, to a very large extent, by an examination of the activities of Antwerp, its chief port. The inland water transportation facilities connecting Antwerp have a length of 1,473 miles and its waterway traffic is approximately one-half of its seagoing traffic. By the cheapness of this transportation Antwerp is able to compete with such distant ports as Genoa for the export and import trade of Switzerland and the north of Italy.

Our own Ohio River with a thousand mile nine-foot channel, connecting with the nine-foot channel of the Mississippi River, with its vast quantities of commodities in its hin-



FIGURE 7.—A towboat at Memphis. Each barge bears 2,000 tons of freight on a draft of 8 feet. The average running time for a tow, including all stops, is 8 days from St. Louis to New Orleans and 15 days upstream. (Courtesy of Inland Waterways Corp.)

terland, with a rapidly growing industrial territory, with provisions for joint rail and water rates, with an expanding import and export trade, and with more efficient boats and barges is envisioned by many economists as becoming within the next few years the "Rhine of America."

THE NATIONAL POLICY

The present administration is definitely determined toward an expansion of waterways. In his Louisville speech on October 24, 1929, delivered on the occasion of the opening of the Ohio River to nine-foot navigation, President Hoover outlined the Administration's policy for the development of our inland waterways. That policy may be summarized as follows:

1. The modernizing of every part of our waterways which will show economic justification in aid of our farmers and industries.
2. The completion of the intra-coastal waterways program within the next ten years.
3. The continuing development of our littoral waterways and of our harbors from which these waterways extend inland.
4. Continuing improvement of the channels in the Great Lakes.
5. Establishment of private enterprise in

substitution for Government operation of the barges and craft upon our inland waterways when the Government barge lines have passed through the pioneering stages.

It is not proposed to encourage waterways so as to encroach upon the railroad systems of the nation, or build up waterways at the expense of already established forms of transportation. Each, it is said, by government spokesmen, have their own distinct place in our national development.

The statement is made officially "that there is a distinct place in our transportation system for this medium of transportation (inland waterways) just as there is a place for our other media such as railway, highway, and airway, and this medium is urged for the movement of the basic, bulky commodities, thus leaving the higher class of traffic for the faster means of transportation."

In fairness, it should be stated, that railroads are challenging the fairness and the economic wisdom of public development of waterways to compete with privately owned rail carriers. However, railroads with eastern termini on the Great Lakes favor the Great Lakes-St. Lawrence Ship Channel. Published opinions in substantiation of this view have been made by Howard Elliott, Chairman of the Northern Pacific; President H. E. Bryam of the Chicago, Milwaukee, and St. Paul; President C. H. Markham, President of the Illinois Central; Receiver William G. Beird for the Chicago and Alton; President Fred W. Sargent of the Chicago and Northwestern; President Ralph Budd of the Great Northern; President Charles Donnelly of the Northern Pacific; President Edward Pennington of the "Soo Lines"; President Hale Holden

of the Chicago, Burlington, and Quincy; and President Sir Henry Thornton of the Canadian National Railways. The reasons advanced are in many cases applicable not only to the Great Lakes-St. Lawrence Ship Channel, but to inland waterways in other regions. Their statements, however, referred only to the former. They are:

1. The low cost of deep water navigation extends the radius of distribution and develops railroad traffic to and from the ports.
2. Extending marine commerce to Great Lakes Ports is not basically competitive to the railroads, but creates traffic to and from the ports they serve.
3. Increased car efficiency through quicker turn-around and resultant greater earnings per car.
4. Recovery of these roads of a just proportion of the total revenue on interchange traffic.
5. Increased traffic in the territory served:
 - (a) Stimulation in production due to the lowered cost of reaching markets.
 - (b) Greater purchasing power due to (a) and widening the economic margin of production.

A. Lane Cricher, Assistant Chief, Transportation Division of the U. S. Department of Commerce, points out that transportation in the United States during the past twenty years has tended to place the east and west coasts of the country nearer together by approximately \$2.25 per ton (using a staple commodity, taking fifth-class rail rates as a basis). While the coasts have been given faster and cheaper transportation, the central west has experienced freight rate increases, with the result that the entire middle west area has been pyramided—or a row of toll gates placed around it. This area has been moved over \$3.00 a ton further away from the coasts, making a differential favoring the coastal localities of over \$5.00 a ton.

The completion of the Mississippi and Great Lakes System of waterways will tend to place this mid-west area, which includes approximately one-third of the population of the United States, on a pre-war basis as to bulk commodity freight rates. The tendency is a relative increase in north and south movement as compared to east and west movement of goods.

Elimination of waste in distribution through further endeavor to adjust supply to demand probably epitomizes our distribution problem. In this adjustment of supply to demand, undoubtedly, proper inland waterway development, encouraged and aided by proper terminal development along our inland waterway system, will play an important and vital part.

Speaking officially he says, "Most assuredly we cannot say nor would we want to infer that inland waterway transportation, *per se*, should endeavor to transpose the carriage of goods by rail to the carriage of goods by water. In no way do we consider inland waterways simply as competitors for present and satisfactory agencies of carriage of goods, such as our arteries of transportation by rail and their adjunctive service, the motor truck. It is desirable that further efficiency wherever possible be attained in our transport of commerce. It is true, in the same breath, that the railroads will continue as our most important agency of transportation."

The picturesque floating palaces of the days of Mark Twain drew but two and three feet of water and even then occasionally caught on snags and sand bars. Soon they were unable to compete with the rapidly growing railroads; thus river

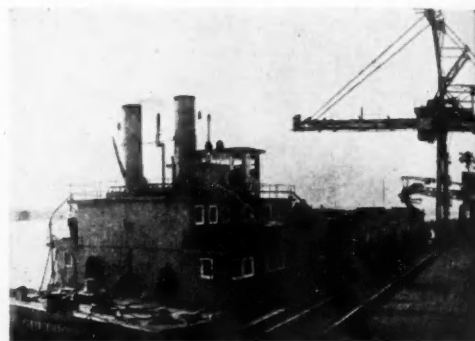


FIGURE 8.—A government ore and coal-handling plant at Mobile with a capacity of 500 tons per hour. A rational adjustment of water traffic to rail transportation, each supplementing the other, is necessary to the best development and utilization of the resources of the land. The rapid rise of industry—agricultural and manufacturing—in America has been due in larger part to the extension of the railway net than to the adequate use of the waterways, but as the pioneer stage of development passes and stability is approached, the supplementary value of the waterways must be recognized. (Courtesy of Inland Waterways Corp.)

navigations passed into its dark ages. Now, however, the unromantic Diesel tugs tow long trains of steel barges.

Thus, what the river has lost in the romance of the early days, it has gained in tonnage. In the early periods 500 tons was a great cargo, but today 10,000 tons is moved with less men and less fuel. New times have brought new inventions, bringing the rivers back as great arteries of commerce after half a century. But these new waterways are not competitive, but complementary to our great and efficient railroads, says President Hoover. It is the history of transportation that an increase of facilities and a cheapening of transportation increase the volume of traffic.

Experience both at home and abroad has taught that inland waterway transportation should be fostered not for the purpose of carriage of highly expensive commodities, but principally for the transportation of

those commodities of great bulk and low value, which would probably not otherwise enter into the distant market and not be moved at all, were it not that the cheaper agency of transportation placed them in a competitive trade channel.

These bulky, less costly goods may be given a wider range of serv-

ice, or more inclusive territory of sales. Goods, which move via a cheaper water agency, where it is cheaper, may in semi- or fully manufactured status, be freight originating for rail, road, motor truck, or airplane. In this way there is a definite place for proper functioning of river agencies of transport.

ABANDONED LAND IN A REGION OF LAND ABANDONMENT

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AMERICA is too young, except for the region along the Atlantic seaboard to yield very rich material for the study of agricultural evolution over long periods of time, or to afford conclusive evidence of satisfactory adjustment or maladjustment of the agriculture to the physical environment; but here and there in this coastal belt may be found examples that seem to show definite trends or even final adjustments.

A COUNTRY-SIDE OF FARM LANDS OF REPEATED ABANDONMENT

Within the confines of a half day's drive of the nation's capital lie extensive tracts of smooth, level uplands which, time and again during the last three centuries, have been cleared, tilled for a few seasons, and then allowed to revert to forest. Here and there, the paved road, swinging through woodland and clearing, carries one past a sometime field grown up into a tangle of white oak and scrub pine, yet so lately deserted as to still show pronounced signs of the last cultivation. Occasionally, an abandoned farmstead, that dejected relic left to mark the blasted hopes of a once roseate human enterprise, rears its ugly unkempt form, and silently informs the passerby that here a man struggled and met defeat.

Mingled with these deserted tracts are numerous sunny clearings green with corn or wheat, in pasture, or now and then in truck. Large size apple and cherry trees of old age

and in straight rows take the place of the jumbled, tangled scrub forest. Here the farm buildings usually speak of duration, a degree of success or even prosperity. Some of these lands have been in almost continuous cultivation since white man's first general occupation of the region.

This checkered country of fairly successful and rather steadily tilled farms and of poor, oft-abandoned fields, extends along the Coastal Plains which fringe the western side of Chesapeake Bay south of Washington. It includes much of the historic lower Potomac-James River district of Virginia. Practically all of the area lies within ten to twenty miles of the water's edge, as it is broken into three peninsulas—locally known as the Northern Neck, the Middle Peninsula, and The Peninsula—and these in turn are splintered into smaller tongues. The coastline is one of submergence with its resultant numerous estuaries. Ease of access, combined with the favorable (level) surface configuration and a genial climate, threw the area open to early settlement and in a comparatively short time, it became rather fully occupied. But in the last century, there has been a heavy loss of population—so much so that some counties have hardly one-half their former numbers, and the district has become widely known as one of land abandonment.

AN AGRICULTURAL COMMUNITY

From the days of the first planters to the present time, the basic eco-

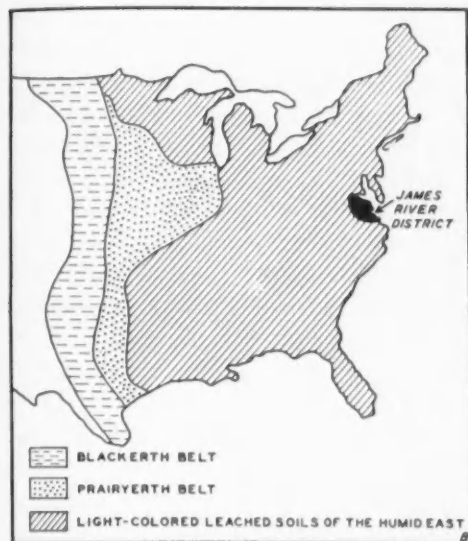


FIGURE 1.—Sketch map showing general location of the Lower Potomac-James River district, the blackerth belt, the prairyerth belt, and the light-colored leached soils of the humid East.

conomic adjustment has been agriculture. Following the Jamestown settlement in 1607, a substantial part of the lands were gradually cleared, and presently plantations stretched "for miles along the rivers and creeks." At first there was hardship, but a crop surplus soon developed and the colony plunged into commercial agriculture. The small-bulk-and-high-value tobacco went to Europe and a limited amount of the more cumbersome food-crops, to New England, which already in those days had begun to show its economic dependence upon lands other than its own.

Albeit tobacco furnished the leading commercial crop, general farming, based chiefly upon corn and wheat with sufficient livestock to supply local needs, constituted the mainstay of the planters. Negroes were gradually introduced to supply the arduous labor in the tobacco fields. With only minor alterations, this system of tobacco and general subsistence farm-

ing continued until about the middle of the nineteenth century.

MOVEMENT TO THE DARK-COLORED SOILS OF THE WEST

This period brought about two revolutionary events. One was the emancipation of the negro, following which tobacco all but disappeared. The other was the opening of the rich dark soils of the West to settlement. Extending from Manitoba to Texas lay a broad belt of virgin soils, the American counterpart of the renowned blackerths of Southern Russia, and to the east of these another belt of dark-colored soils, the prairyerths.¹ Both were free of timber, rich in plant foods, and so constituted physically that they broke up into loose, crumbly seedbeds, ready for planting as soon as the sod was turned. Crops might be produced upon them from one year to another without perceptible decrease in their quality and without the addition of manure or commercial fertilizers. Even the cruder systems of farming, except those leading to erosion, did not seem to despoil them. As a result there was widespread abandonment in every eastern state, the Chesapeake district, in common with all the settled East, pouring a much grudging measure of its population upon them.

THE EAST, A REGION OF NATURALLY IMPOVERISHED SOILS

The widespread abandonment of land in the East for the dark-colored soils of the West has generally been attributed to soil impoverishment and ruthless exploitation: failure to rotate, to manure, to employ a

¹ Blackerths = black earths; prairyerths = prairie earths. See the author's *Major World Soil Groups and Some of their Geographic Implications*, *Geographical Review*, Vol. XIX, 1929.

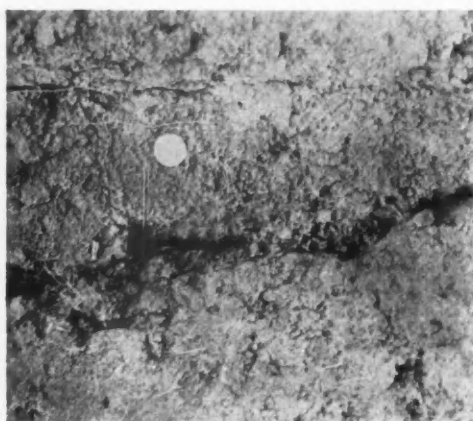


FIGURE 2.—The well-knit, fine granular structure of the western blackerths. Compare the small soil aggregates with the ten cent piece. Each aggregate is made up of silt, fine sand, and clay particles, but these are so cohesive that they cling together with great tenacity. This makes plowing and seed bed preparation easy since the aggregates act like huge sand grains and fall apart. The spaces between the aggregates form natural passageways for rootlets, air, and water. Soil material so organized is ideal for agriculture.

scientific system of farm management—in short, to the so-called doctrine of “soil exhaustion.” While such conditions contributed, in a measure, to the general decreasing fruitfulness of the soils, the really significant circumstance in the matter is the fact that nature herself had “robbed” the soils long before the first colonist set foot upon the continent. It so happens that the soils lie in a climatic régime in which the annual rainfall has been relatively heavy. Hence, for centuries, nature had been dumping tons of water upon them and tons were absorbed. These picked up such plant foods and other soluble substances being formed as the soil materials decomposed and carried them away. Gradually the soils became impoverished and acid in reaction.

With chemical impoverishment came physical deterioration, especially in the case of the finer-

textured types (heavy loams and clays). Ideally the tiny particles of which these types are composed should adhere strongly to one another and form larger units or masses which soil scientists call “structure aggregates,” or simply “structure.” This organization is highly important, for roots, air, and water find the spaces between the aggregates easy to penetrate. Soil material so organized is also easy to plow, as the structure masses are only slightly inter-cohesive and fall apart. But under the heavy rainfall régime of the East, the chemical constituents necessary to maintain the structural organization in a well-knit coherent state have, to a large extent, been removed. Under *natural* conditions the aggregates retain their form, but when cropped, they gradually disintegrate. They do not crumble immediately, but break down by degrees until finally the soils become increasingly puddly and gummy when wet and tend to crack seriously in periods of low rainfall.

Regarded either chemically or physically, therefore, these soils were made comparatively poor, and the act was accomplished in the destructive workshop of nature herself. Let no one, accordingly, upbraid the westward-resorting migrator, except where his practices led to erosion, that he carelessly stripped the East of its agricultural treasures or seriously deprived future generations of their share of its productivity. Concrete evidence of his innocence may be gathered everywhere in many small areas throughout the region. Here and there are fence rows, cemeteries, tracts under buildings or structures, and other bits of land, even in highly farmed areas, which have not been cultivated. The soils

of these areas show their content of plant foods to be essentially as low as that of the adjacent field which was once cultivated and then abandoned because "exhausted." At best these soils exhibit only a slightly higher percentage of soluble constituents. The presence of these materials suggests why the soils of the East were temporarily productive and not so difficult to cultivate for a few years after clearing. The consumption of this small reservoir of plant food is the only "cream-skimming" of which man may be accused, but its fat content was very low, and the injury to the soil by its removal and non-replacement is a minor matter.

THE WEST, A REGION OF NATURALLY UNIMPOVERISHED SOILS

The blackerths of the West present almost the converse characteristics and relationships. The average precipitation, a sub-humid type, under which they developed was so low that the leaching waters could ordinarily penetrate the soil mass to only a few feet and the precious load of plant foods and other soluble salts had to be dropped at comparatively shallow depths. The millions of fibrous roots of the grassland associations, which here form the natural vegetation, were accordingly enabled to reach and return much of these materials to the upper parts of the soil, since on death and decay the roots become incorporated with the soil proper. This periodic rejuvenation and the low rainfall have obviously also been effective in maintaining the soil's structure in prime condition. The aggregates are well-knit and remarkably resistive to disintegration: the normal soils crumble readily upon plowing, have good internal drainage,

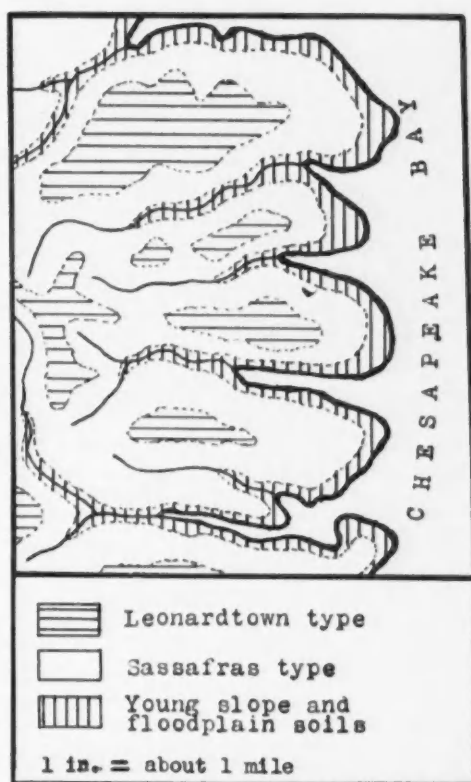


FIGURE 3.—Idealized diagram showing the relative distribution of the old-age Leonardtown soils occupying the flat interstream uplands of an earlier topographic cycle, and the mature Sassafras type of the gently undulating, well-drained uplands of the present cycle. Associated soils, such as the imperfectly drained upland swamps, are omitted.

and do not crack badly in dry seasons. In short, these soils in contrast to the light-colored soils of the humid East were evolved and preserved as "good" soils.

The prairyerths, lying to the east of the blackerths, are also rich, dark-colored soils of good structure. Their structure is slightly inferior and they are somewhat less fertile than the blackerths, as the higher precipitation under which they developed (average over 25 inches annually) has leached them to a greater degree. The natural vegetation here was also grass, but the roots had less to draw upon. For

the purposes here contemplated, however, the two soils may be regarded as having unimportant differences. Both comprise soils of the highest order. As incentives for agricultural migrations and land abandonment, there are none their equal. Who would not give up a farm rendered poor for one which has been kept rich by nature?

NATURE OF THE TEMPORARILY ABANDONED LANDS

Now, as noted on earlier pages, the Potomac-James River district not only shared a period of general land abandonment with the humid East at large, but it also embraces two markedly unlike types of smooth, upland soils. One of these comprises soils which, though leached, have, aside from the period just noted, been cultivated virtually from one generation to another; the other includes a type also leached, but tilled and abandoned repeatedly since the period of first settlement.

The prolonged use of the first type may be largely ascribed to its favorable physical characteristics. A large proportion of the soils are sandy textured, and where of fine texture the soils possess a physical make-up so constituted that it is economically profitable to improve it. The structure is poor when compared with that of the blackerths; yet, when properly handled, the soils can be kept in a good state of cultivation indefinitely.

Granted a good physical constitution, the chief defect—a poverty of plant foods and organic matter—can easily be remedied by the mere addition of the proper materials, i.e., fertilizers and other constituents. In a sense, the soils are like rather well-conformed but emaciated beasts

of burden. Both soil and beast require merely the proper foods (fertilizers) and intelligent handling (plowing under correct moisture conditions), after which each is capable of performing most faithful service.

These soils have therefore been the mainstay of the agriculture of this Chesapeake district. They may be and have been abandoned, due to the opening of new, richer black lands, to changed social conditions as those brought about by the Civil War, or to altered economic conditions, such as relative isolation, resulting from improved forms of transportation, but these circumstances are relatively temporary and exceptional. General abandonment declines after adjustments to the new conditions are made.

NATURE OF THE REPEATEDLY ABANDONED LANDS

Externally, both the repeatedly abandoned lands and those of prolonged utilization show no strikingly unlike characteristics on casual superficial examination by the layman. Both are light in color, naturally forested, and seem similarly constituted as far as general features are concerned. Both occupy the same type of land form—smooth, level uplands ideal for farming. The only easily discernible differences of any moment are apparently minor. The repeatedly abandoned lands are confined chiefly to certain flatter, divide-like areas separating the estuaries, and they are prevailingly rather loamy or finer in texture. Such textures are ordinarily preferred for general farming, as they are better suited to cereals, yet mark their frequent abandonment, albeit that general farming has been the prevail-

ing and most economic system of the district.

The real defect is internal. The soils have tough hardpan subsoils. These, combined with the flat topography, make them poorly drained internally as well as externally. Hence, water collects on them after every rain, and they are cold and wet in spring, thus delaying plowing and planting. In midsummer they are inclined to dry out and crack open, as the dense subsoil yields water slowly. And, of course, most crops

Heavy fertilization is therefore necessary and lime and organic matter must be liberally applied. Open and tile drainage must be provided to carry off the surplus water and facilitate early planting. To prevent clogging of the tile inlets by the fine clay and silt particles, the tile must be covered with coarse sand or gravel.

No wonder these soils have suffered frequent abandonment by unwary folk who are ignorant of their limitations! Their general loamy



FIGURE 4.—One of the well-improved and more prosperous farms founded upon the impoverished but tractable soils of the Chesapeake uplands. The good physical constitution of these soils makes them very responsive to manuring and proper management. Corn is usually the leading crop.

find the hardpan almost impossible of penetration.

Add chemical impoverishment, which they share in common, with the continuously cultivated type, and it becomes self-evident that the permanent and remunerative utilization of these soils calls for an unusual expenditure of capital and labor. They are even more thoroughly leached than their associate soils, and distinctly more acid. The great loss of soluble constituents has so weakened the structure that the soils are hard to plow except under the most favorable moisture conditions.

character is attractive in comparison with the widespread sandy soils of the district. Covered with timber, stone free, and lying high and flat, they presented an irresistibly inviting picture to the land-hungry colonist. Yet, what novice would have dreamed of the curse within their bosoms. The stony, rock soils of New England displayed their warning signals so that the most ignorant might read and understand.

THE PEDOLOGIC CYCLE

Seeking the explanation for the striking differences in these two

types of soil lying side by side and yet derived from similar materials, the geographer must turn to modern pedology or soil science.

Here he would learn that in late years pedologists no longer regard soils as mere inert entities made up chiefly of the left-behind materials of rock decomposition mixed with organic matter, but that soils are now believed to "grow" so to speak like other natural changing objects—or, compared with the organic cycle, that there are *young*, *mature*, and *old* soils.² He would also learn that as soils evolve, they gradually lose the properties or characteristics imposed upon them by the geological formations from which they were formed, and acquire an entirely new set of basic properties. In other words, he would be told that as rocks decay, they cover themselves with a mantle of earthy material and that the upper part of this earthy mantle slowly changes to another natural body, the soil, whose fundamental characteristics are wholly unlike those of its parent formation.

YOUNG SOILS

The properties of the infant soil are naturally much like those of the parent mantle rock, but various changes soon occur. Under the influence of the climatic conditions and organic life prevailing in the region the soil occupies, alterations in the mineral matter take place, and new physical and chemical substances are produced. Water percolates through the soil and translocates some of the material formed in solu-

tion, either depositing it elsewhere or completely removing it from both top soil and subsoil. Organic life establishes itself, interacts with the mineral substances, and various amounts of its waste become an intimate part of the growing soil.

MATURE SOILS

When the new attributes acquired as a result of the action of the climate and organic life form the dominant basic characteristics, the soil is interpreted as having reached maturity. It has now developed an anatomy analogous to other natural phenomena, the major parts of which are called "horizons" or "layers." Each horizon differs in chemical composition and physical organization both from the original parent formation and from its associates. In each horizon the clay, silt, and sand particles are characteristically assembled as agglomerates or masses which the soil student calls "structural aggregates." Each horizon also assumes a peculiar coloration and biological composition. In short, the mature soil is still an earthy formation, but it has evolved as a new entity whose basic properties are very different from those of its parent formation.

Level Topography and Soil Maturity

Obviously soil material can reach maturity only in situations of relative stability. If subject to removal or deposition during the process of development, the features imposed upon it by the climate and organic life do not accumulate. It follows then that normal mature soils develop chiefly on smooth, level, well-drained areas, such as undulating upland surfaces and terraces.

² The time required to complete the cycle from youth to old age is, like that of the river or land form cycle, not measureable in years but in units of time comparable with the shorter earth molding or geological processes.

Young Soils and Gradational Topography

Young soils are naturally the products of areas subject to gradation—aggradation and degradation. They occupy hill and mountain sides where, due to continuous degradation, the soil material does not lie in place long enough to acquire the features of maturity. Here the soil is continuously rejuvenated as the altered surface materials are removed by erosion and the new, fresh, and relatively unchanged underlying formation is brought to the surface. The soils of floodplains and other areas exposed to deposition are likewise young, for the deposits are also subject to frequent modification and the materials do not lie in place long enough to be fully acted upon by the climate and organic agencies peculiar to their regions. Such features as they possess are principally due to the accidents of deposition.

OLD SOILS

Old soils, like old organic beings, have gone beyond the state of maturity. They possess many of the features of mature soils, but in addition have acquired abnormal features such as tough hardpans, or an advanced state of alteration of their mineral matter and as complete leaching as their environment can bring about. They evolve on old, level land surfaces in which situations they have been undisturbed for an indefinite period of time.

The "Old" Chesapeake Lands

Returning now to the oft-abandoned lands of the Chesapeake district, it should be evident that these are old soils. It was previously noted that the soils occupy the flat

divide-like areas of the uplands. These are the peneplanic remnants of a former topographic cycle. Here the soils have been long undisturbed and are consequently thoroughly leached. Moreover, the subsoils carry an unusually large percentage of silica which appears to act as a



FIGURE 5.—A tomato canning factory near Tappahanock, Virginia. Only farms within easy hauling distance of the cannery try this form of commercial agriculture and then chiefly as a side line.

binder, fills the interstitial soil spaces, and gives the soil material an almost impervious hardpan condition.

Those who tilled these lands, therefore, were cultivating old, worn-out lands, aged by nature. Like old organic beings, they have lost their verility and perform work with difficulty. Their systems have been drained of the original supply of force and energy. Their arteries are clogged and work slowly. Undue climatic conditions are weathered with difficulty.

The "Mature" Chesapeake Lands

The associate Chesapeake lands, the relatively non-abandoned type, are obviously chiefly mature soils. They no longer possess the freshness and versatility of youth, and are low in plant foods, in view of the heavy rainfall of the region. But they are either sandy or possess a moderately good structure and only a moderately heavy subsoil, and so are responsive to fertilizers and do not

remain wet late in spring. Hence, as long as normal economic conditions maintain, such soils are retained under cultivation.



FIGURE 6.—The natural forest recovering its dominion on the fertile Sassafras soils of the Northern Peninsula. Almost all signs of the last cultivation have here been erased, since economic competition drove this field into agricultural retirement sometime ago.

Most of the young Chesapeake lands are not in cultivation. The hillsides are subject to erosion and the level uplands are more attractive. The floodplain soils and those occupying the scattered shallow depressions of the uplands are imperfectly, and sometimes poorly, drained.

COMMERCIAL ISOLATION

Though easy to improve and maintain in good condition for cultivation, the mature soils of the Potomac-James River uplands are largely in a state of general, if not almost subsistence, agriculture. There are really two soils involved here, known as the Sassafras and Norfolk soils by the Bureau of Chemistry and Soils. Tidewater, Virginia, is an area of soil gradation, the belt of transition separating the reddish and yellowish soils of the southern Coastal Plain from the grayish brown soils of the northern Coastal Plain passing

through the district. The Sassafras are representative of the northern, the Norfolk of the southern, group. The two soils differ in a number of respects from the pedological point of view, but may here be regarded as presenting essentially analogous general geographic relations. The old soils comprise the Leonardtown series. Being well drained, warming up early in spring, and being very responsive to fertilizers, they make ideal trucking lands. In fact, soils exactly like them form the cornerstone of the entire Atlantic Trucking Belt extending from Long Island to Florida.

Commercial isolation, however, has retarded the development of similar industries in these Chesapeake uplands. The broken peninsular character and the lack of adequate rapid transportation facilities to suitable markets comprise the chief physical handicaps. Only here and there, as in the section tributary to Norfolk and other large centers, has the production of vegetables for sale proved attractive. The production of potatoes, a crop well adapted to the acid soils, has reached a degree of importance in the southeastern counties and the acid tomato is a special crop of the northeast. Yet, the leading outlet for the greater part of the latter crop is only the cannery. Since the Civil War, the district as a whole has been unable to develop a readily marketable commercial crop, a condition so vital to, and so characteristic of, American agriculture.

Not only has the district as a whole been organized largely on a subsistence basis, therefore, but a large part of the potentially productive Sassafras soils has also been in a state of rather wide abandonment, and much land in former cultivation



FIGURE 7.—A vigorous road building program is under way. The cut here eases the grade across one of the valleys cutting across the level plain.

is being reclaimed by the natural vegetation. On the other hand, the country-side is by no means one of complete evacuation and in late years has awakened to a new life. The need for a more scientific agriculture is gradually being realized. The spirit is in the air and on the roadside. Occasional sign boards proclaim the merits of so-and-so's fertilizers. Demonstration fields, with sign boards indicating the exact amount used, show the passerby the advantages of fertilized fields. As the climatic conditions permit, the growth of both winter and summer crops and the soils make fairly good pasture when properly handled, and are admirably adapted to stock raising.

The transportation defects are also being corrected. Long contentment with mere isthmian intercourse with the mainland is giving way to desire for regional and inter-peninsular connections, and new bridges are slowly spanning the estuaries. Failure to encourage railroad building in earlier

years is being gradually offset by the construction of new, or the improvement of old, highways, opening up the less accessible areas or linking up existing roads with the surrounding world. Much interest is also being shown in restoring and commercializing the wealth of historic features, and there is strong bidding in the tourist market. The region is to some extent becoming a retreat for well-to-does. The federal government has acquired extensive acreages for flying fields. All these promise increased markets for truck, fruit, and dairy products.

The outstanding social factor is the negro. He comprises roughly one-half of the population. His contentment with a subsistence agriculture is proverbial. Some negroes in the district maintain their farmsteads in a condition equal, sometimes superior, to that of their white neighbors. But, the majority are satisfied with the barest maintenance and some live in such tumble-down shacks, that the figurative, "Nigger

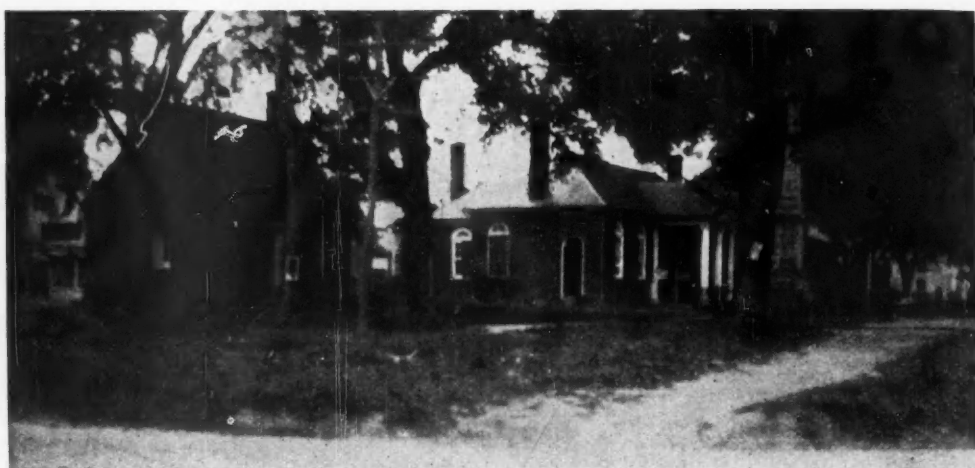


FIGURE 8.—Old court house and debtors' jail, built before 1754 at Gloucester, Virginia. Unlike New England, the wealth of colonial features of the Jamestown district has been but little capitalized. Now, however, there are signs everywhere to guide the historical zealot to his shrines.

in a Woodpile," assumes almost literal significance.

PRINCIPLE OF OLD SOILS AND LAND ABANDONMENT

The repeated abandonment of old soils—soils aged by nature—is a typical geographic phenomenon. It has occurred and is occurring elsewhere. The Ozarks, for example, have similar bodies of old soils which are likewise being abandoned. Why wrestle with such marginal land?

Little did the English dream that

their first real colony established in North America *with an economic aim* had been set down in a region marked by old soils and one of few such regions along the Atlantic seaboard. Manifestly, the chief factor which promoted settlement was in all probability the protective and accessible nature of the coast, and the settlement succeeded because of the equable climate and the fact that the old soils do not predominate. Had the region been one of prevailing old soils, the outcome may have been quite different.

GEOGRAPHIC AREAS OF CITIES

William T. Chambers

Geographer, Stephen F. Austin State Teachers College

THE great modern city is man's largest and most complex artifact. It contains scores or even hundreds of square miles of rather closely "built up" land, and is a veritable hive of human activity. It is the supreme focus of the commercial, manufactural, transportation, professional, social, and political life of a large contiguous territory. The central section tends to be a maze of congested, noisy, canyon-like streets between compact rows of towering buildings which are occupied by shops, stores, banks, hotels, offices, and factories. On its margins are terminal districts with many parallel railroad tracts, long strings of cars, steaming locomotives, moving trains, busy passenger and freight stations, spreading warehouses, and large factory buildings.

Extensive areas largely occupied by manufacturing plants lie along the water-courses and railroad lines which extend toward the margins of the city; and between them are large stretches of land occupied by associations of old tumble-down houses, flat and apartment houses, small modest homes, luxurious homes, and by streets, parks, playgrounds, and aviation fields. Still farther out are spaces, yet unappropriated by the growing city, of which some are platted and ready for development, some are held for speculative purposes, some are used as market gardens and dairy farms, and here and there about the intersections of important transportation routes are

the far-flung suburban or satellite cities with their relatively small business, manufacturing, and residential districts.

CULTURAL SEGREGATION WITHIN CITIES

A pronounced tendency toward the grouping of urban phenomena into ecological associations, and the presence of different sorts of urban areas, is observable within cities. Thus, attractive, well-drained land of relatively great accessibility to all or much of the city's population, particularly if the people habitually buy and sell there, offers great advantages for the operation of shops, stores, banks, and other businesses. Business firms willingly pay sufficiently high rents or purchase prices to obtain possession in competition with other sorts of potential occupants. Thus, a business area appears which grows and prospers with expansion in volume of business done and declines with its reduction.

Land having unusual advantages for manufacturing, such as exceptional ease of assembling industrial materials, excellent contact with large consuming markets, proximity to an efficient labor supply, to skillful managers and enterprising capitalists, and reasonable land values, are developed as factory sites. This gives rise to manufacturing areas known as "industrial districts" which are characteristic of large manufacturing cities. Land located near to business and factory districts is in



FIGURE 1.—Typical view in the "skyscraper" or "Loop" section of the central business district of Chicago. Looking east on Washington Street toward Lake Michigan which shows as a dark streak in the background.

demand for use as home sites by persons employed in these areas providing it be readily adaptable to residential occupation. Accordingly, spaces between business and factory sections are largely occupied by residential communities which vary directly in quality with their attractiveness and suitability for residence, and with their freedom from objectionable contact with damaging environmental features such as business, manufacturing, and railroad properties.

Physical conditions exert much influence upon the use made of various portions of the city site. Some combination of land forms,

water bodies, and historic events accounts for the convergence of regional and local transportation routes at a particular place in the city and the development there of its chief business center. These natural conditions, together with the relative availability and suitability of land at the time of appropriation, exert much influence upon the location of wharves and railway terminals and adjacent clusters of warehouse, wholesale, and factory buildings.

Extensive areas of relatively level land which are penetrated by railroad, highway, and waterway, and are located in or near a large city tend to be developed as manufacturing districts because of their unusual adaptability to such use. Very poor residential districts almost invariably occupy land made undesirable for habitation by conditions of the natural and cultural environment. In many cases the site is low, poorly drained, and subject to occasional overflow. A characteristic location is on the outskirts of the central business district where old, deteriorated, obsolete dwellings are interspersed with business and factory properties. Poor residential areas also occur in the vicinity of noisy railroads and smoky manufacturing districts. The most attractive residential sections, on the other hand, are located in areas where natural and cultural conditions combine to facilitate the development of exceptionally beautiful and dignified homes.

Human-use momentum is another important factor in determining land utilization in cities. In many cases more capital is invested in developing an area for utilization than in the purchase of the land occupied. Since buildings and other constructions are designed for a specific use any

change of use is apt to involve losses of fixed capital which is inadaptably to the needs of the new occupant. Thus, if an area is built up with residences, the capital investment in homes deters its appropriation for business, manufacturing, or other uses which cannot profitably occupy existing buildings and other improvements.

However, the rise of land values frequently enables the sale of properties having old deteriorated struc-

TYPES OF URBAN AREAS

Several sorts of urban areas which occur in practically all cities are readily recognizable. The presence of different residential neighborhoods which vary in significant respects, and of a central district which is specialized for the transaction of business, is axiomatic. Many cities have one or more business areas of minor importance, each of which centers about a secondary focus of



FIGURE 2.—A heavy manufacturing area at Joliet, Illinois. It occupies lowland along the Des Plaines River, has excellent railroad services, and adjoins residential areas which furnish a labor supply.

tures at amounts exceeding the total original investment. In cases of change in land utilization old buildings may be replaced by new ones, or they may be remodeled to meet the needs of the new occupant. Thus, old residences are converted into apartment or rooming houses, and a building vacated by one business or manufacturer may be occupied by another. Such extreme metamorphosis as the adaptation of homes to business, and of churches to warehouse or residential utilization, occur in the older sections of cities.

transportation routes. The manufacturing district is also an integral portion of the large modern city, and increasing efficiency of transportation services and facilities stimulates the growth of suburban centers.

CENTRAL BUSINESS DISTRICT

Probably every city, whether large or small, has a central or major business district. It is an area of shops, stores, and offices, of wholesale houses, factories, and institutions located at the place of convergence of chief local and regional transportation routes. It has the

tremendous advantage for business of maximum accessibility from all sections of the city and its environs, and of being the place where many people are accustomed to transact business. Hence, all those concerns which cater to city-wide and regional patronage seek business locations here to facilitate their commercial activities. The limited size of the area and keen demand for business sites within it force land values and rents to high levels, and stimulate the intensive use of space by the increase of business efficiency and by the construction of high buildings. These tendencies are checked to some extent by expansion of the area into adjoining residential districts which increase the amount of available space; but the advantages for business of central location in the area are so great that such expansion ordinarily is quite slow.

The central business district has much individuality. It dominates the local retail and wholesale trade, and is the chief center of the recreational, social, and political activities of the population. The buildings are in general higher, more closely spaced, and occupy a much larger portion of the available land than in other districts. Compact rows of business houses crowd upon the street margins to secure maximum proximity to passing traffic and efficiency in the display and sale of goods and services.

People come from all portions of the city and its trade territory to make purchases in shops and stores; to consult physicians, lawyers, and other professional men; to attend churches, schools, and theatres; to visit club houses and governmental buildings; to utilize transportation services maintained between this

and other places; and to work in the shops, stores, factories, and other enterprises operated here. Therefore, pedestrian and vehicular traffic attains maximum density on the streets and thoroughfares, and becomes so crowded in the shopping section during business hours as to win for that area the name of the "congested district."

The central business district is the nucleus of the city—the center about which it is organized and from which its activities are directed. Residential and manufacturing areas cluster compactly about it, and are intimately connected with it by through streets and the services of common carriers including street car and bus lines and railroads. The supreme importance of the area in recreational and social life of the population is attested by location within it of the more important theatres and the quarters of those churches, fraternal societies, and civic organizations which attract membership and patronage from many portions of the city.

Government and public buildings such as the city hall, post office, auditorium, municipal library, and court house are also located in the area. Central location and accessibility from all portions of the city, familiarity among the entire population, and momentum due to past performance make the central business district the "logical," "natural," and "best" place in which to hold civic, community, and popular gatherings.

People from all portions of the city can assemble here with maximum ease, efficiency, and comfort. This is the one portion of the city in which all its people feel at home, and to which none attach

sectional or factional character. It is more nearly public than any other part of the city because important public properties are located in the area and most parts of it are occupied by organizations which minister to the needs of the city in one way or another. Hence the central business district is in a sense a public area, and an expression of the life, activity, vigor, and growth of the city. It is the focus of community life and the organizing center of city activities. Among transient and out of town people this central urban area is generally considered synonymous with the city itself.

MANUFACTURING AREAS

Many cities have one or more well-defined manufacturing districts. Land in these areas is occupied by or reserved for factories because it better suits the needs of industrial than other potential occupants. It is traversed by railroads and highways, and in cases by waterways, which facilitate the assembly of industrial materials and the marketing of goods produced. It is readily accessible from residential districts which serve as sources of labor supply; and has the additional assets of availability in sufficiently large continuous blocks to meet the space requirements of given sorts of manufacturing concerns, and of sufficiently low relief to facilitate appropriate plant construction. The kind of buildings used and the type of manufacturing done vary with the location of the area in the city, with the size of the city, and with the regional supply of industrial materials.

"Heavy" manufacturing plants tend to congregate in areas some distance from the center of the city where adequate space is available,



FIGURE 3.—Residential and business properties in "Little Mexico," an area peopled by Mexicans, and located just north of the central business district of Dallas, Texas.

and other conditions favor their operation. They utilize large quantities of heavy, bulky material such as coal, coke, petroleum, ore, earth, stone, iron, steel, and wood; and must have easy access to efficient "dead freight" transportation services to facilitate the assembly of material and the shipment of products. They employ hundreds and, in cases, thousands of workers, many of them doing rather hard heavy labor. Adequate space must be available for the handling and processing of materials in quantity without transferring them from one level to another. Many industries of this sort need large quantities of water for use in cooling mechanical equipment and in process work.

Therefore, heavy manufacturing districts tend to develop in places having unusually efficient transportation services by rail and water, excellent access from populous residential districts from which a labor supply may be drawn, essentially level land available in large continuous blocks, and a dependable source of water supply which is available at low cost. Effective protection from overflow, waves, mass erosion, and other destructive natural agencies is also essential. Large low buildings

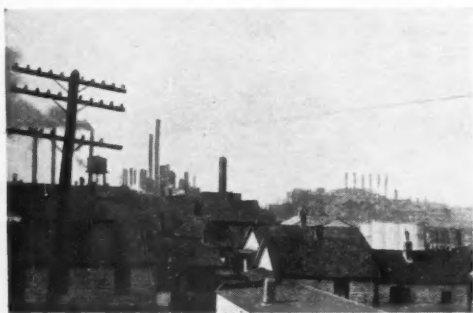


FIGURE 4.—Poor urban housing adjacent to a heavy manufacturing district at Joliet, Illinois. The dwellings were occupied largely by Polish families.

are characteristic, and there are towering smoke-stacks which give strong drafts and lift smoke and fumes high in the air so the wind will sweep them away.

Manufacturing districts in closely built-up portions of cities are occupied by "lighter" sorts of factory industries. The sites are relatively small and the buildings are commonly two or more stories in height. They are located along railroad lines, and in some cases are interspersed with wholesale and old residential properties. The plants are served by railroad sidings and by streets which may or may not be paved. A water storage tank upon the roof which helps maintain the pressure in the mains is characteristic. Rather valuable materials are processed as paper, cloth, chemicals, leather, flour, vegetable oils, cream, sugar, and coffee; and among the myriad products are clothing, magazines, books, paints, baking powder, shoes, bread, butter, shortening, ice cream, candy, and toilet articles.

Many of the products are distributed throughout the national market, and also in some foreign countries as a result of small bulk, high value, and effective advertising; but others, on the other hand, are

limited to the regional market. Labor supply is drawn from various parts of the city, and power, light, and water are purchased from public utilities. The advantages of central location with reference to the city market and its labor supply, together with proximity to freight station, express office, post office, and bus terminal more than offset the high land values and taxes which attend location in closely built-up urban areas.

RESIDENTIAL AREAS

All cities have poor residential districts because many of their inhabitants are unable to pay the high rent attractive urban housing commands. Such areas, frequently designated as "slums," are characterized by deteriorated, obsolete houses, dirty unpaved and poorly paved streets, and impoverished populations of diverse racial composition. Here dwell the unskilled laborers, poor recruits from rural areas who are "pioneering" in the city, peasant immigrants from foreign lands, and others who are near the margin of subsistence. Cosmopolitan slum populations in large American cities tend to subdivide into rather compact racial communities which are derisively known by such names as Little Italy, Little Russia, Little Poland, Ghetto, Chinatown, and Black Belt.

These communities adhere more or less closely to the language, customs, and modes of living native to their respective populations. Some sections of poor residential districts are strongholds of vice and organized crime, and most of them are seriously overcrowded and unsanitary and have high death rates. Poor residential areas tend to fringe the central



FIGURE 5.—Excellent stone and brick dwellings in an exclusive residential area on South Sixth Street, Terre Haute, Indiana.

business district, adjoin manufacturing areas, and occupy urban lowlands unsuited for better housing development by occasional overflow and smoke accumulation.

Exclusive residential areas develop

landscaped grounds, and are characterized by smooth pavements, winding drives, numerous shade trees, clean pure air, and beautiful parks which impart a pleasing, wholesome aspect to the community. Here are



FIGURE 6.—View at Wilmette, Illinois, one of the excellent suburban residential communities located on the lake shore north of Chicago.

because fine urban homes are rather consistently located in exceptionally attractive neighborhoods which greatly enhance the desirability and value of the property. They contain large distinctive houses with spacious

the homes of successful bankers, merchants, manufacturers, realtors, and professional men; and here high living standards and élite society attain climax development. The population is almost altogether native



FIGURE 7.—Cottage homes in a recently built-up area near the northern margin of Dallas, Texas.

born, and in America it is white. Its density is relatively low because of prevailing small size of families and large size of home sites. These residential areas appropriate parts of city sites made especially suitable for home building by natural and cul-

Cottage areas probably are more extensive than any other sort of urban residential district. The homes are small and closely spaced, but have modern conveniences and are designed for families of average income. They vary from distinctive



FIGURE 8.—Cottage homes of a type found in the older sections of many American cities.

tural conditions. Most of them occupy undulating to level uplands which have the advantages of fertile soil, large trees, proximity to a lake, seashore, or park, access along pleasant drives to the central business district and to attractive rural areas, and freedom from objectional features of all sorts.

attractive residences to neglected deteriorating ones. In places, long rows of almost identical houses line the streets, giving a monotonous aspect. The inhabitants include skilled factory workers, artisans, clerks, and a variety of business and professional people.

There are communities of second

generation foreigners and negroes, but the population is largely of native white stock. Many families are home owners and others are making payments on property. Population density is greater than in exclusive residential areas because there are more children per family and home sites are smaller here, but overcrowded unsanitary conditions are generally absent. Cottage areas adjoin poor housing districts in the central parts of the city and extend outward to the margins of the built-up area. Their inner parts tend to deteriorate to the slum type with increasing age, and new construction occurs along their outer margins.

Other types of urban residential communities are readily distinguishable. Areas of furnished rooms, "flats," and apartments exist near the central business district and in the vicinities of colleges and universities. As a rule the houses are rather large old structures. The inhabitants include migratory young people of moderate to small income such as clerks, stenographers, sales persons, and students. Most of them are unmarried, but newly married, childless couples are numerous.

Economic and social instability, together with small financial resources, cause them to seek furnished quarters within walking distance of their respective places of present employment. Unfurnished apartment areas develop in places of average to good residential quality which are rather near to or have superior transportation services to the central business district. These areas are extensive in large cities where high land values and construction costs tend to prohibit home ownership within reasonable distance of the business center. They are



FIGURE 9.—Apartment house on West End Avenue at Nashville, Tennessee. Buildings of this sort are being erected on that arterial street which connects the most exclusive residential area with the central business district of the city.

peopled by small families since couples having several children usually withdraw to the suburbs where land values are lower and space is available for the play of children. Highly attractive places in apartment house areas of very large cities tend to be built up with "skyscraper" apartment houses and hotels, each of which can house hundreds or even a thousand or more families.

Suburban areas possess the advantages for residence of lower land values, less noise and traffic, cleaner purer air, and better-organized community life than thoroughly urbanized districts. Therefore, they attract relatively stable, home-owning, child-rearing populations. They vary in aspect from associations of palatial country estates of millionaires in highly attractive areas to clusters of workmen's houses adjoining the sites of large manufacturing plants.

INTER-AREAL BOUNDARIES

The boundaries between adjacent urban areas vary much in definiteness and precision of location. In some cities physical barriers such as escarpments, valleys, streams, railroads, or other features abruptly delimit adjacent areas. In places the street pattern apparently deter-

mines the precise location of boundaries, and properties fronting adjacent streets are very different in function and aspect. Thus, a main thoroughfare may be developed for business while nearby streets are in residential districts, and paved streets bordered by attractive residences may be closely paralleled by unpaved ones which are lined with deteriorating dwellings.

In many places abrupt boundaries are replaced by zones in which a

direction and the consequent shifting of boundaries. Most boundaries between urban areas lack stabilizing barriers, and tend to be zones of rivalry between different sorts of occupants.

As an area grows, the demand of its inhabitants for increased space causes their penetration of adjacent, less intensively occupied districts. Such invasion meets resistance because the presence of the new element usually reduces the desirability of the



FIGURE 10.—A "skyscraper" apartment house area in Chicago. It is located about seven miles south of the business center, and has the advantages for residence of position on the lake shore beside Jackson Park, of express suburban service (electrified) by the Illinois Central Railroad, and of a beautiful lake shore drive to the central business district.

more or less gradual transition between the areas is evidenced by the mingling of phenomena characteristic of each of them. The important thing is that boundaries exist, whether as lines or as zones, and that they may be observed and mapped.

The boundaries which separate urban areas vary much in stability. Those which closely parallel such physical features as escarpments, bodies of water, valleys, and ridges have relatively great stability because these barriers to movement tend to prevent invasion from either

area for the older class of inhabitants. If the city is growing, this resistance is overcome because the need for more space forces the invaders to offer sufficiently high rent to secure possession, the old inhabitants are expelled, buildings are adjusted to the needs and standards of the new inhabitants or are destroyed to make room for new ones, and areal boundaries are shifted accordingly.

Thus, increasing demand for sites in the central business district may make its expansion advisable. Old residences adjacent to the business

district are torn down to make room for new business structures to supply this demand. Consequent decrease in the supply of old residences causes greater congestion in the old house area, and this tends to force invasion of adjoining better residential districts by the crowded population. Properties occupied by the invaders promptly deteriorate to the standard of their new inhabitants, and thus become a part of the old house or poor residential district. The population of the invaded areas

conditions and in human utilization, they are geographic units and should be studied as such.

Like larger regions they derive individuality from general uniformity of landscape features such as the sort of land occupied, the aspect of improvements, the activities and attitudes of occupants, and the relations between these factors. Urban areas have continuity of extent and essential unity of function, and they differ from adjoining land in one or more significant respects. The en-



FIGURE 11.—View in a suburban manufacturing village. This community is a property of the Grasselli Chemical Company, located near Terre Haute, Indiana. It adjoins the factory site, and houses the families of workmen employed there.

in turn invades other sections farther from the center of the city. Thus, the pressure is transmitted from area to area until it is absorbed by the construction of new houses, many of which are located on the margins of the city where the intensity of occupation is relatively low.

URBAN AREAS ARE GEOGRAPHIC UNITS

Urban areas, particularly those used for residence, are known as "natural regions" of cities among sociologists. Since each of them is a portion of earth surface which has homogeneity in major environmental

environment of an area attracts appropriate sorts of occupants and tends to exclude others. Moreover, urban areas have a leveling effect upon their inhabitants, who tend to become accustomed to the modes of living, opportunities, and experiences afforded.

Thus areal homogeneity is developed and considerable social solidarity is achieved. This makes for areal stratification of urban populations, chiefly on the basis of standard of living; and promotes "class" distance and antagonism just as regional alignment gives rise to conflicting interests which frequently

result in political struggle and warfare.

CONCLUSION

Great modern cities are the largest and most complex creations of man. The tendency of their phenomena to group themselves spontaneously into associations causes the appearance of distinctive urban areas such as the central business district, the light manufacturing area, the heavy manufacturing area, and various sorts of residential neighborhoods.

The physical character of land, the improvements upon it, and its location with reference to other urban areas and to transportation routes help determine its utilization. The central business district is situated at and about the major focus of transportation routes, the precise location being due to historic causes and to the local distribution of land forms and water bodies.

Associations of factories appropriate land having exceptional access to waterway, railway, and highway services which facilitate the assembly of materials and labor, and the dis-

tribution of products. They also need relatively level land, an abundance of power and water, and proximity to markets and labor supply. Spaces between business and manufacturing areas tend to become residential communities which vary in quality with the suitability for residence of the land and its improvements.

The poorest sections are unpleasantly near to business and manufacturing areas. The best residential district is located where natural and cultural advantages for homebuilding are greatest. Small, closely spaced houses occupy much of the residential section; and areas of furnished rooms, of apartment houses, and of suburban homes occur in large cities. The urban area is a small, intensively occupied geographic unit. It possesses general uniformity of landscape, of human utilization, and of relations between these factors. Since several types of areas tend to appear in every city, their detailed analysis probably would contribute materially to the development of urban geography.

ECONOMIC ADJUSTMENTS IN LIBERIA

G. T. Renner

Geographer, University of Washington

FOR 108 years, America's only daughter country, Liberia, has tenaciously clung to a precarious and oft-times, well-nigh hopeless national existence. Today, this little Negro republic is beginning to see a century of confidence in herself justified. A slight change in the world's economic-geographic organization promises to make of her one of the most prosperous parts of Africa.

HISTORICAL GEOGRAPHY

Early in the nineteenth century, the American Colonization Society planned to provide a home on African soil for Negro ex-slaves. Sierra Leone was first selected as a colonization site, but after a change of plans, the Society purchased Mesurado Promontory on the coast of what is now Liberia. In 1821, a colony of 80 negro freedmen was planted on Providence Island a few rods offshore. Sickness and starvation came near to obliterating this first little colony, but the timely arrival of more settlers with several shiploads of supplies finally saved the venture from complete disaster. Thus reinforced, the colonists began the settlement of the mainland, although the native tribes were violently hostile to the intruders.

By 1838, there were more than 2,000 settlers on the coast and along the St. Paul River, and all of the coast from Mesurado Promontory to Cape Palmas had been acquired from the natives. The colony had become strong enough by 1847 to cast off the

tutelage of the American Colonization Society and to declare itself a republic. Ten years later the separate Negro colony of Maryland joined Liberia. Maryland had been started in 1833 as a group of settlements along the lower Cavalla River some 250 miles east of Cape Mesurado. However, in 1857, it elected to give up its separate existence and to become instead one of the four counties in the Liberian Republic.

While settlement was progressing in the coastal zone, political control was rapidly extended into the interior. By the middle of the nineteenth century the republic had reached quite sizeable proportions; but from that time until the first decade of the twentieth century, Liberia's area shrank bit by bit. Since Liberia was unable to effectively control the large hinterland which she claimed, France and Britain frequently nibbled at her boundaries. Probably they would have ultimately divided Liberia between them had they not been held in check by the commercial plans of Germany, plans which were encouraged by Liberia as the only means of preserving her existence.

In 1908, Britain would undoubtedly have annexed Liberia to her Sierra Leone holdings had not the official and semi-official influence of the United States restrained her. In 1912 an agreement was finally reached wherein the United States Government (acting with the consent of Britain and Germany) assumed

virtual charge of Liberian finances, army organization, and boundary adjustments.

At the present time Liberia comprises an area nearly as large as New York or the New England states, variously estimated from 38,400 square miles to 45,000 square miles. The country extends for 300 miles along the Upper Guinea Coast from Sierra Leone to French Ivory Coast and reaches inland a distance of 100 to 200 miles. Inhabiting this territory are somewhere between one million and two million people. The

civilized Christian negroes of the coastal regions are the million and more indigenous negroes of the interior. These latter are either Moslems or followers of various natural religions and exist under primitive social and economic conditions.

GEOGRAPHIC REGIONS

There are three geographic regions in Liberia: (a.) The Americo-Liberian Region, (b.) The Pastoral Savanna Region, and (c.) The Agricultural Forest Region. The first-named region is by far the most important in



FIGURE 1.—Providence Island, where the first Liberian colonists settled. (Courtesy of L. A. Roy.)

density of population averages between 35 and 50 per square mile—a density comparable to that of Iowa, the most representative agricultural state in the United States.

The coastal inhabitants alone evidence any degree of modern civilization, and of these not more than 50,000 exist under anything like an American standard of living. While the Americo-Liberians politically dominate the country, they number only about 15,000 and are apparently not increasing. Their birth rate is not high and only two or three thousand immigrants have arrived from America since the Civil War. Contrasting greatly with the 50,000

Liberian geonomics; the second occupies by far the largest area but is relatively undeveloped; and the third is not only very small in area but is almost unknown to the outside world.

THE AMERICO-LIBERIAN REGION

The Americo-Liberian Region comprises the coastal plain, together with the lower valleys of the St. Paul and Cavalla Rivers. The coastal plain is, in general, a flat to rolling surface, averaging about 25 miles wide, but is dotted by occasional hills of from a few feet to several hundred feet in height. The coastline is in many places fringed by offshore bars which enclose shallow brackish lagoons.



FIGURE 2.—The Liberian Republic has recently occupied the critical attention of the League of Nations and the American government because of the prevalence of the slave trade with the alleged connivance of government officials. Little is known of large areas of the interior, and it is chiefly along the coast and the banks of the rivers that the land is best known.

Behind the lagoons the country is a maze of swamps, estuaries, and sluggish rivers which alternate with higher ridges and hills. The coastal region is rather abruptly terminated on its interior margin by hill-country which completely interrupts river navigation and to a lesser extent land travel. The coastal region of Liberia is one of the rainiest portions of Africa, rains occurring during all months of the year. Monrovia receives an annual average rainfall of 180 inches, while in the eastern coast

districts the rainfall is even greater. Almost all of the rain falls from March to November, during which period the Guinea Monsoon blows strongly. December, January, and February are, on the other hand, markedly dry. As a result of this abundance of rainfall which is interrupted by but a short dry season, together with the high temperature and humidity, most of Liberia was originally covered with a magnificent tropical rain forest. However, within the Americo-Liberian zone

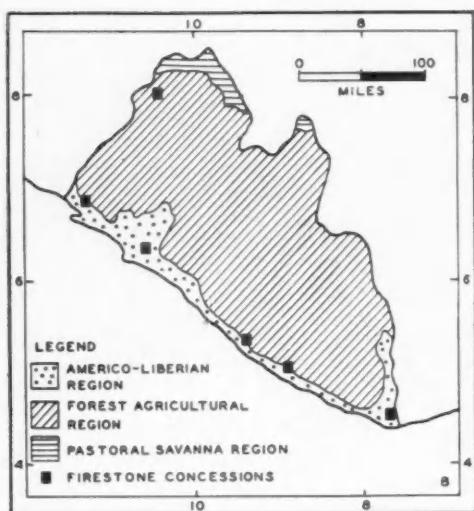


FIGURE 3.—Geographic Regions of Liberia.

most of the virgin forest has been destroyed and replaced by bush, scrub forest, open grassy areas, and occasional patches of cultivation. Inhabiting the coastal zone are several tribes of negroes, chief of whom are the Vais who occupy the country west and north of Monrovia, and the

rians are scattered along the entire coastline but show a noteworthy concentration in Maryland County and along the lower St. Paul River in Montserrado County.

Monrovia

In spite of the favorable equipment in climate, soil, relief, and natural waterways which the coastal lands possess, agriculture in the Americo-Liberia region is surprisingly neglected and the population is mainly urban. Monrovia, Careysburg, Grand Bassa, Greenville, Jacktown, Harper, and a score of smaller towns are to be found in this region. By far the most important and largest town is Monrovia, the capital, which contains somewhat less than 10,000 inhabitants.

Monrovia is built on hilly ground adjacent to the estuary of the Mesurado River. It has no harbor and only fair connections with the hinterland, yet it is the commercial center



FIGURE 4.—Light forest growth near Monrovia, rather characteristic vegetation of the coastal areas. (Courtesy of Firestone.)

Grebos who are located near Cape Palmas in the south. Several settlements of Krus are to be found along the central part of the coast and its fringing bars. The Americo-Libe-

of the Republic. A bar lies across the mouth of the estuary, so ships must anchor offshore and goods and passengers be taken to the city in surf boats manned by Krumen. In cross-



FIGURE 5.—View of the city of Monrovia, showing the Mesurado Estuary leading inland from the Atlantic Ocean. At the left may be seen the sand bar which divides the estuary from the open Atlantic. (Courtesy of Firestone.)

ing the bar into the lagoon, the rollers necessitate skillful handling of the boats if upsets are to be avoided. The city's water front is lined by a mass of galvanized iron warehouses and a few small landing places. Skirting the shore is a ragged street called "Waterside" which is lined by small native shops and large foreign trading stores. Parallel to Waterside are four long streets, each at a somewhat higher level up the hillside, while steep cross-streets run up the hill at right angles to the main thoroughfares. The streets are wide and straight but so rocky, and in places so steep and overgrown by vegetation, that wheel traffic is difficult. The buildings are in the main rather poor affairs, but there are a few fine structures. The other towns of the coastal zone are even less imposing than is Monrovia.

Americo-Liberian Agriculture

Outside the coastal towns, the Liberians live in more or less isolated farms and hamlets along the coast or the lower courses of the rivers. In the district immediately adjacent to Monrovia, many Americo-Liberians are settled upon small holdings. These might very well supply the town with adequate quantities of fruit, poultry, vegetables, rice, and other grains. But Monrovia imports

rice and tinned provisions and gets along with but few fruits and vegetables. This is illustrative of conditions throughout the entire coast zone of Liberia. Means of transportation and economic coördination are so poorly worked out that agricultural production has advanced little beyond the subsistence stage. Rice, sugar cane, bananas, plantains, manioc, Liberian coffee, a poor variety of corn, and many kinds of vegetables are grown with little labor. The mango, an importation from the Indies, is found everywhere near the seacoast and along the rivers where the Liberian settlements have been longest. Breadfruit, coconut palms, oil palms, and cotton trees occur in considerable abundance. The future development of this region will come through the evolution of a plantation type of agriculture based upon the production of marketable staples. Rice cultivation is already receiving considerable attention in the eastern section, the rice produced being finer and larger than most of that produced in the Orient. There is an abundance of heavy dark organic soil with stiff clay subsoil throughout the coastal zone which is capable of producing enormous crops of rice. Similarly, coconuts, which at present receive but scant attention, could be produced abundantly on the light,



FIGURE 6.—The landing beach at Monrovia in 1920. Aided by the recent American loan, Liberia is building a modern port as part of its general metamorphosis into a thoroughly modernized rubber producer. (Courtesy of L. A. Roy.)

friable sandy soils so common near the coast. Sugar cane, the production of which is now concentrated mainly along the St. Paul River is also capable of an almost indefinite increase. Many plantations of cocoa now exist near Cape Palmas, and in Montserrado County, near Monrovia. Climate, soil, and labor conditions favor this industry, which needs but proper encouragement to equal that of the Gold Coast farther east.

Indicative of what can here be done by plantation agriculture under European management is the rubber industry. Years ago, English capitalists realized that Liberia, with its immense rainfall, tropical heat, and large areas of soil which possess proper characteristics of relief and drainage, offered as good or better natural conditions for rubber growing than did Malaya. Accordingly in 1910, they set out 1,500 acres of rubber trees which are now yielding abundantly. The recent entry of the Firestone Company into Liberia for the purpose of greatly increasing the rubber plantation industry there promises immediate development for the Americo-Liberian Region. De-

velopment in rubber planting will undoubtedly bring development in other lines of plantation agriculture, and with such development, general economic progress in coastal Liberia.

THE PASTORAL SAVANNAS

In the extreme northern part of Liberia beyond the great forest of the interior, the country is covered with open park-like forest and bush, usually referred to as *savanna*. In the main, this region is broken mountain country which forms part of the southern rim of the Niger Basin. The land averages about 1,500 feet in elevation so that the climate is much less enervating than that of the central and coastal areas. The dry season, except for short periods when the Harmattan blows, is quite healthful and pleasant. The inhabitants

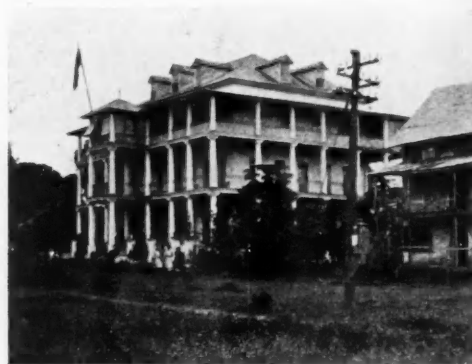


FIGURE 7.—The White House, Monrovia,—the home of the Liberian president. This structure is a typical piece of Americo-Liberian architecture. (Courtesy of L. A. Roy.)

of the savannas are chiefly Mandingoes and allied Sudanic folk who are pastoral in occupation. Most of them are nomadic, dwelling in small moveable villages. These pastoral folk rear large numbers of cattle, horses, goats, and woolless sheep. Most of these are consumed locally but occasionally they are sent down to the markets in Sierra Leone. Oc-

casionally, too, some ivory is sent out to the coastal towns of Liberia.

Mandingo women pick considerable quantities of the native wild cotton, card and spin it into yarn, and dye it with vegetable dyes. The men weave it into cloth of good grade. Small numbers of Mandingoes travel southward through the forests from village to village trading cloth and other commodities for kola nuts, peppers, and other native produce. If this region is ever rendered less inaccessible than at present, consider-

A tall and dense rain forest of magnificent aspect covers all of interior Liberia from the River Mano on the west to the Cavalla River on the east, and from the Americo-Liberian region to the savannas near the northern boundary. Some of the trees of this forest, such as the Ceiba, attain a height of 160 or more feet. Along the river banks are dense stands of rattan palms, occasional clumps of bamboo, and impenetrable stretches of jungle. Mahogany trees are rather generally distributed through



FIGURE 8.—An Americo-Liberian dwelling on the banks of the lower St. Paul River. (Courtesy of L. A. Roy.)

able development in livestock rearing is almost sure to take place.

AGRICULTURAL FOREST REGION

In contrast to the rather level coastal lowland, the interior of Liberia is quite hilly. From an altitude of approximately 400 feet at the inner margin of the coastal belt the country gradually rises to an elevation of about 1,200 feet in the northern interior. The climate becomes progressively better toward the interior, for the increasing altitude gives cooler nights and fresher air during the day. Some of the higher mountains which rise above 5,000 feet in elevation, are quite temperate in climate.

the forest; ebony and other cabinet woods occur in the central portions of the forest, particularly in Grand Bassa and Sinoe Counties. There is in the Liberian forest a score of trees, shrubs, and vines which yield wild rubber. Of these, the *Landolphia Owariensis* vine is perhaps the most abundant yielder of commercially valuable latex. The finest quality of rubber obtained in the Liberian forest is derived from the rubber tree, *Funtumia Elastica*, which is quite plentiful in Sinoe and Maryland Counties.

From Kolahun southeastward to the French boundary, oil palms occur in great numbers. In many places



FIGURE 9.—A mission school in Liberia showing a part of the school gardens. These schools are a powerful agency for improving native agriculture. (Courtesy of L. A. Roy.)

the forest is almost a solid stand of oil palms. All told, the interior forests of Liberia contain an inestimable wealth, but nemoriculture has as yet scarcely begun in this region. Indeed, the country is not even accurately known beyond 40 miles from the coast.

The inhabitants of the Liberian forests number perhaps one million and are composed of a varied assortment of tribes. The Golas inhabit the country immediately behind the

The Bassas are very numerous and are spread over large areas of the interior. These peoples are dominantly agricultural, carrying on their farming in forest clearings, but some supplementary nemoriculture and besticulture also are engaged in.

The indigenous tribesmen live almost entirely in towns and villages, generally walled or surrounded by stockades. Some towns are of considerable size and contain from 4,000 to 5,000 people. A dozen towns range from 1,000 to 2,500, but most of them contain but a few hundred inhabitants. The village huts are small, mud-walled and heavily thatched with palm leaves as a protection against the all-pervading wetness of the rainy season. In most villages the houses are crowded on the hilltops in order to take advantage of air drainage. Rice, manioc, and millet are cultivated in abundance. Bananas are also grown and a few goats and fowls are kept by each family.

Two crops of corn per year may



FIGURE 10.—An inland village on the banks of the St. Paul River. (Courtesy of L. A. Roy.)

Vais of the north coast, the Goras occupy the middle St. Paul valley, and the Kpwesis are distributed over the central and northeastern sections.

be obtained from land manured with ashes, but this grain is not in very general use. Rice is commonly grown on newly cleared hillside land.

The crop ripens in August and is harvested during the late summer diminution in the rains or "middle dries." The bulk of the rice crop is consumed locally, but in good years, considerable quantities are sold across the border in British and French territory. Native farming is carried on under a rotating system of forest clearing and land abandonment. Each year, every family clears and

Most families grow their own cotton; the women pick, clean, spin, and dye it while the men do the weaving. There is, too, considerable commercial activity, particularly in the larger towns. Markets are held on fixed days and they are attended by traders from near and far. In the districts near the French border, large numbers of Mandingo traders bring livestock, cloth, and calabashes from

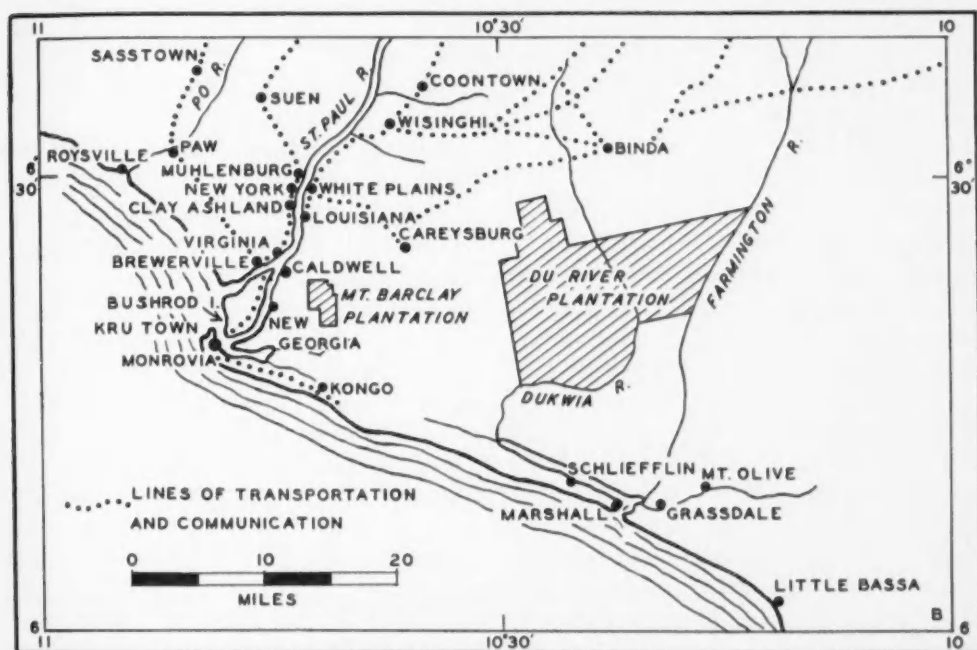


FIGURE 11.—Map, showing the lower St. Paul valley and the nearby Firestone rubber developments.

plants a new area in the forest. At the end of the year this land is relinquished to the upspringing jungle and is never reoccupied before seven or eight years have elapsed. This is, indeed, a primitive form of agricultural adjustment, but it has an advantage of not robbing the soil of its fertility.

A considerable amount of native handicraft manufacturing is carried on in the towns, smithing and cotton weaving being the chief industries.

French territory and exchange them for native agricultural and nemoricultural produce. Everywhere in the Forest Agricultural Region communication is exceedingly poor. Transportation between towns and with the outside is solely by means of native portage over winding forest trails. The surprising fact is that there are as many and varied exports as now exist. All that is needed is a railway into the interior to make Liberia's hinterland an extremely

important producer of many important articles derived from agriculture and forest exploitation.

SEQUENCE OF ECONOMIC ADJUSTMENTS

For nearly a century, Liberia has struggled to find some dependable export commodity around which it could build its finances, but so far it has failed to accomplish anything permanent. As a consequence, the commercial aspects of Liberia's economic geography appear as a fleeting pageant of continuous adjustment and readjustment.

SUBSISTENCE AGRICULTURE

During the first few decades of Liberia's existence, economic adjustments to the natural environment were for subsistence purposes only. The transfer of civilized ex-slaves, in the early 1800's, to a strange and primitive environment was attended with almost insuperable difficulties. It is amazing that the scheme for colonization succeeded at all. Naturally enough, the country's energies were for many years completely absorbed by the pressing necessity for supplying its own needs. Agriculture became at once practically the only occupation in the country. Crops were experimented with; methods of clearing, planting, and cultivation were gradually learned; a type of architecture was evolved; and suitable habits and ways of life were worked out only after years of trial and error.

Sugar

Liberia's first attempt at producing a marketable commodity occurred during the Civil War period in the United States, when the sugar planters of the lower south were cut off

from the outside world. "Sugar plantations soon lined the St. Paul River and raw sugar was hurried across the waters in little sailing vessels which the Liberians built themselves. For ten years the trade went on. Liberia began to accumulate some wealth and confidence." But finally the Louisiana sugar plantations resumed production and the West Indies began to increase their output. Almost simultaneously came the development of the beet sugar industry of the cool temperate zone. Moreover, there began at this time an integration within the sugar industry and a supplanting of sailing vessels by steamships in the sugar-carrying trade. These several occurrences very shortly ruined the Liberian sugar growing.

Coffee

Following the collapse of the sugar industry, Liberia gradually developed a considerable export trade in coffee. The Liberian berry, a species of the coffee plant, is apparently indigenous to Liberia and flourishes all over the country. The trees require practically no attention other than picking which is done toward the close of the dry season. Working with unskilled labor, and lacking machinery and adequate transportation, Liberia eventually found herself unable to compete with the organized producers in Brazil and elsewhere. For a time the industry almost disappeared but the coffee output for a few years before the World War averaged nearly 900 tons, valued at about \$200,000.

Oil Palm Products

The place of coffee in Liberia's export trade was gradually usurped by

¹ DuBois, W. E. B., "Liberia and Rubber," *The New Republic*, Nov. 18, 1925, p. 328.



FIGURE 12.—Group of Liberian laborers at the Mt. Barclay plantation, bringing in latex to the central point for inspection. (Courtesy of Firestone.)

the products of the oil palm. Oil palms occur in abundance in the coastal areas but the forests of Liberia's hinterland are probably richer in this resource than of any other area in West Africa. There is a ready market in Europe for palm oil and kernels, the former bringing about 30 cents per gallon, and the latter \$1.50 per bushel. But here again, Liberia lacked organization and equipment; hence other parts of the Guinea Coast have outstripped her in this industry.

Piassava and Camwood

Along the banks of the Lower Dukwia and other rivers, a species of raffia grows wild on swampy ground. From it piassava fiber is made. Some of it is exported in the raw state but much of it is made into brooms, brushes, and other articles for local use. For several years this export grew rapidly, only to be suddenly crushed by having the shipping rates raised nearly 500 per cent by those controlling the carrying trade. The export of camwood dye was also killed by the competition of German synthetic dyes.

Rubber

Toward the end of the first decade of the twentieth century, England began what appears to have been a program which would have led to the annexation of Liberia to Sierra Leone. As part of this program, the Liberian Rubber Corporation, Ltd., was organized in 1904 for the supervision of the collection of rubber royalties. In 1910, under the leadership of Sir Harry Johnston, a rubber plantation was laid out and planted at Mount Barclay between Monrovia and Careysburg which lies some 30 miles inland. Nearly 2,000 acres were planted with more than 135,000 rubber trees. By 1914, nearly 20,000 trees were tapped, by 1915, some 50,000 trees were tapped; and in 1916 the entire plantation was yielding latex. Had the British plans for annexation materialized, this plantation would have been greatly increased, but as matters eventually turned out, the plantation was abandoned, and one more chapter in the economic geography of Liberia was closed.



FIGURE 13.—Newly felled forest land along the Dukwia River in Liberia. (Courtesy of Firestone.)

In 1925, The Firestone Tire and Rubber Company of Akron, Ohio, became interested in producing rubber under American control in order to escape the monopoly prices of the British growers. After examining environmental and economic conditions in Mexico, Central America, the Philippine Islands, and elsewhere, it was decided to begin production in Liberia. The first step was the organization of a \$100,000,000 corporation known as the Firestone Plantations Company. The second step was to secure a 99-year lease on one million acres of land from the Liberian Government. The third step was the restoration of the abandoned British rubber plantation at Mount Barclay. "These trees show splendid growth, are free from disease and have been constantly yielding more than 500 lbs. of rubber per year, which is 40% better than the general average of all of the rubber plantations in the Far East."²

Nurseries of rubber plants have been started and 10,000 grafted rub-

ber trees of the best quality have been imported from Sumatra. By 1929, six million rubber trees had been planted on 30,000 acres. This area lies in some eight plantations, averaging 3,000 acres each on the lower Dukwia River and are reached in a few hours by good motor road from Monrovia. About 11,000 acres had also been planted in Maryland county. Two other concessions lie in Montserrade County and one each in Grand Bassa, Sinoe, and Maryland Counties.

In 1927, Liberia received a \$5,000,000 loan at 7 per cent interest from American capitalists with which to reorganize and stabilize her finances. In addition, the Firestone Plantations Company is rapidly installing improvements in many parts of the republic. Harbors are being built, motor roads are being constructed, and clearing and planting of rubber land is proceeding rapidly. Great quantities of motor trucks and machinery are being imported, and thousands of native laborers are being hired. As early as 1927, nearly 12,000 natives were employed by the

² Personal communication from Harvey S. Firestone, Jr., March 12, 1927.

company, exclusive of the 100 skilled white workers and officials. In 1928, approximately \$1,025,000 in wages were paid. From all reports, this labor is better and healthier than that in the Asiatic and Indonesian rubber regions. Ultimately it is planned to produce 250,000 tons of rubber annually, a procedure which will eventually require nearly 300,000 Liberian workers. As part of the general development scheme, the Firestone interests are erecting a modern American city to house its workers, conducting exploration, installing hydro-electric plants on several of the rivers, drilling wells and planning in coöperation with Liberian Government an adequate school system for the country.

Liberia's Future

At the present time Liberia is exporting small quantities of rubber, palm oil and kernels, piassava, cabinet and dye woods, coffee, ginger, ivory, and kola nuts. In exchange she imports rice, salt, textiles, hardware, building materials, kerosene, gin, tobacco, and canned foods. This trade exists in spite of the almost complete lack of development of the country. There are indications of coal, bauxite, petroleum, iron, and other metals, but large deposits of these seem unlikely. Liberia's fu-

ture would appear to lie in adjustments to soil and forest resources. If rubber growing develops upon the scale proposed by Firestone, it will absorb most of the labor supply for years to come, and it will bring Liberia to where she will supply fully one-half of the tremendous rubber consumption of the United States.

If additional labor be found, cacao, bananas, rice, and copra may also be produced in the Americo-Liberia Region. The population of the interior is fairly dense throughout, considerably more so than in Sierra Leone. If a railway were built from Monrovia into the interior as the British have done in Sierra Leone, a large trade in palm oil and kernels would result. In addition, the production of an agricultural surplus would be stimulated; cotton, tobacco, coffee, kola, and ginger would come out in much larger quantities than at present. With markets at the end of the railroad, considerable numbers of livestock would be driven southward from the savannas of Northern Liberia and across the border in French Guinea. Even should such a railway not be forthcoming, the recent entry of the Firestone interests into Liberia marks the beginning of a new order of affairs in Liberia. Certainly, her future looks brighter than does that of most other parts of tropical Africa.

THE ITALIAN HARBORS ON THE ADRIATIC SEA

Bruno F. A. Dietrich

Geographer, Hochschule für Welthandel, Wien

IN HER post-war program of economic and political expansion, Italy has inaugurated a number of new projects that are revolutionizing her whole policy of national life, and not least of these is the establishment of whole series of harbors on the Mediterranean and particularly the Adriatic, all based on economic and political considerations. The established dominance of Genoa and Naples in western Italy has heretofore kept her Adriatic ports in eclipse, but with her enlarged maritime vision, Italy recognizes the value and significance of her Adriatic ports, and prepares to realize them to the full.

The Adriatic constitutes one of those long narrow thalassic tributaries to the Mediterranean which have played so vital a part in the development of the lands dependent upon them for marine outlet. These thalassic continuations of the Mediterranean have shared in the activities of the mother sea, and have formed a complementary unit with her which has reflected the prosperity of the major sea, and in this relationship as it affects Italy's future, the influence of the Adriatic bulks as large as any time in its history.

Because of the proximity of the two coasts of the Adriatic, the enclosed character of its basin, and the outlet upon the Mediterranean, the ports situated upon its shores have ever been important in the sea-trade of the Mediterranean, though through-

out history the relative importance, the activities, and the prosperity of these ports have varied with the rise and fall of the powers bordering the sea. The successive declines and advances of the merchant marines and navies of Genoa and Italy are thus attributable to their relation to the Mediterranean as a whole; both these harbors despite their disadvantageous coastal locations have developed to ports of first rank, measured in terms of tonnage handled, both in the past and the present. The definite isolation of the Adriatic has permitted the rise and fall of similar port city states with their own merchant marines and navies, as one or the other gained the ascendancy.

The northern ports—Venice, Trieste, and Fiume—represent different types of coastal environment and adaptation. Venice, with 200,000 inhabitants, is situated on a group of islands in the center of the so-called active laguna, a shallow coastal bay-region behind the long sandy barrier of the lido, a typical lowland harbor. The enlarging delta region of the Po and Etsch Rivers, in historical times, has changed the ancient port of Ravenna into an inland city. The moving sand, gravel, and mud deposited along the coast by coastal streams, and the detritus brought into the laguna by the small Brenta River always have been a menace to the port of Venice. The main problem of Venice has been to assure an outlet to the sea.

Trieste, the ancient Tergeste of the Romans, is quite another type, situated on a very small foreland of the calcareous Karst Mountains of the peninsula of Istria. Land in Trieste has ever been at a premium. The rocky mountains covered with maqui and other shrub vegetation rise abruptly from the shore up stony slopes to a plateau with poor vegetation.

Venice includes some rivals of ancient times which now are small island cities or special harbors for fisheries, as Chioggia. Venice is a harbor with a far-flung economic background—the entire area of Mediterranean vineyards of Northern Italy, with its intensive horticulture, its rice fields, and its silk industry based upon the great groves of mulberry trees for feeding the worms.

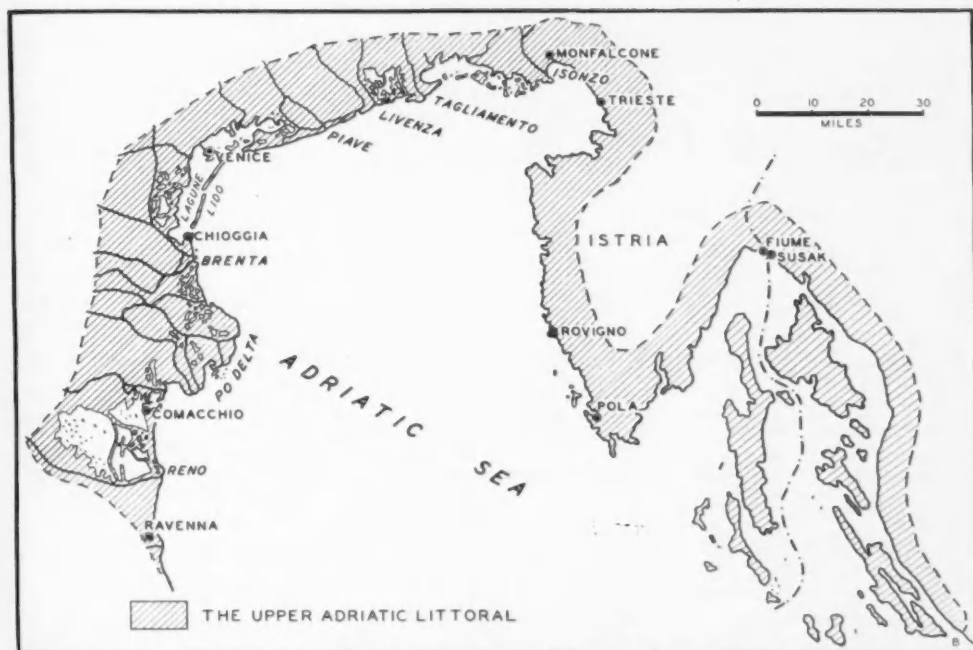


FIGURE 1.—The littoral of the upper Adriatic where Fascist Italy is developing ports and harbors on a grand scale to restore Italian merchant marine to an important rôle in the nation's economy.

Fiume, now sharply separated by a political boundary from its Jugoslavian neighbor and rival, Sušak, the smallest of the Italian harbors on the Adriatic, has a situation similar to Trieste. A small land area gives the site for city and harbor at the base of the Dalmatian karst ridges, with series of small islands along the Dalmatian Coast, the crests of a submerged mountain chain.

The lowland harbor system of

The other two harbors are situated in bays, with a background of mountains among which all plateaus and ridges from Istria to Dalmatia have no agricultural significance. Only a very small Mediterranean coastal zone set with olive trees and orange groves reflects any Mediterranean economic character. Rough in relief and poor in resources, the mountains increase the difficulties for connection of the coastal region with the Cen-

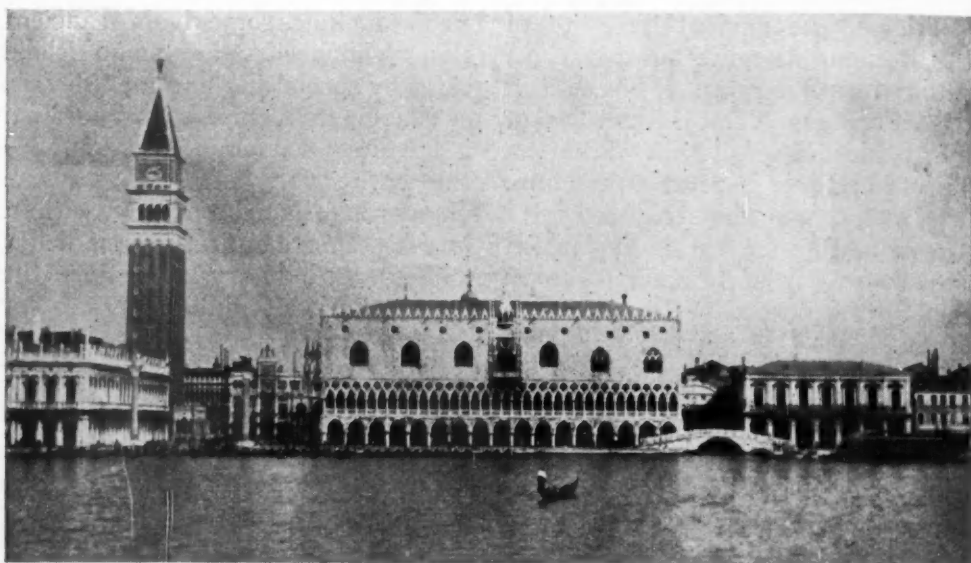


FIGURE 2.—By the waters of Venice; a view of the Campanile, the palace of the Doges, and the Piazza between.

tral European background and the Danube valley.

HISTORICAL DEVELOPMENT

The history of the two main harbors on the Adriatic begins in Roman

the years 452 to 568, was for one thousand years ruled by the Doges. The lion in her coat-of-arms indicates her position as the mightiest sea power on the Adriatic and after the final decline of the Roman

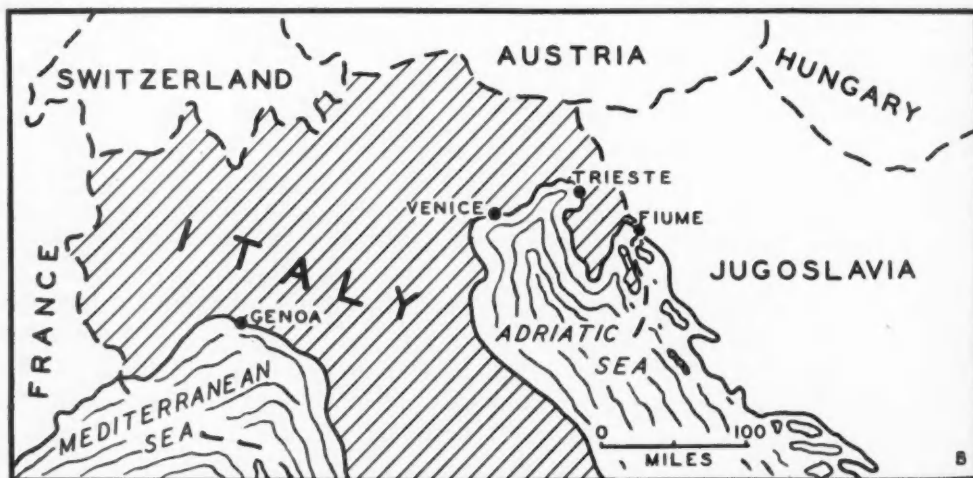


FIGURE 3.—The hinterlands tributary to Venice and Genoa, rival Italian ports.

times. Since then the harbors have been rivals on the Adriatic.

Venice, founded on the island of Rio Altus and constructed in

Empire, in the whole Mediterranean.

At the end of the eighteenth century, the dominant sea power on the



FIGURE 4.—Venice on its island location; Maestio; Chioggia; Porto Marittima; and Porto di Marghera.

Adriatic lapsed to Trieste, at that time a possession of old Austria (from 1382 to 1919), the center of the "Holy Empire of German Nation." Trieste harbor contained as many as 6,000 ships in its basin in 1763, among them 12 East India merchantmen in regular service. In 1866 the province of Venetia was lost and Venice ceded to the new kingdom of Italy. The economic hinterland of Trieste was thus divided between two different countries. Venice became the Italian harbor on the Adriatic Sea, while Trieste remained Austrian. The ancient rivalry between Venice and Trieste was revived on a new political basis. About the same time the dual monarchy of Austria and Hungary agreed that Fiume should be developed as a special harbor for Hungary.

Thus, the three harbors became oriented in three different directions

with different potentialities to develop, Venice for the North Italian lowland, Trieste and Fiume for the countries beyond the mountain ranges. The natural commercial frontier line between the two harbors, Genoa and Venice, lay across the North Italian Lowland (Lombardi). The two Austrian-Hungarian harbors were connected by rail with Central Europe. In 1854 the Semmering railway from Vienna across the Alps to Trieste started the development of Trieste as the foremost marketplace on the Adriatic Sea, with the result that until the World War the spheres of economic influence of the three harbors were as follows: Venice had commercial relations with the eastern part of the North Italian Lowland and across the Alps to the upper Inn

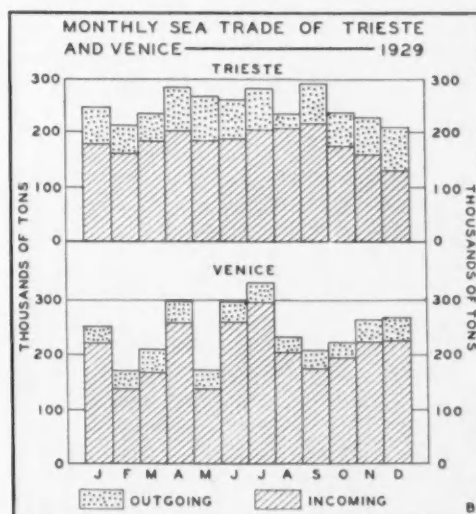


FIGURE 5.—The trade of Venice and Trieste compared by months.

River; Trieste had a broad commercial field in the Alps, by way of Munich with Southern Germany and by way of Vienna with Bohemia, at that time belonging to Austria; Fiume remained the harbor for Hun-

gary with its special field in that land.

This status broke down with the end of the World War, the post-war cessions, and the formation of new nations. The most important change on the shore of the Adriatic Sea was that Trieste formerly often called the "German harbor on the Adriatic Sea," was ceded to Italy and Fiume, the foremost special harbor for Hungary, was also granted to Italy. The frontier line was sharply drawn between Fiume and Sušak.

The most important fact in connection with the cession of these two harbors was that their commercial hinterlands were cut off. The frontier of Austria, now an inland republic, lay only about 60 miles from the Sea. The frontier of the newly constructed kingdom of Yugoslavia lay on a line north of Fiume, of which the Dalmatian coastal region belonged to the new State, now a new neighbor of Italy on the Adriatic Sea.



FIGURE 6.—Small craft in the bay along the Lido near the village of Malamocco.

The remarkable change caused by this new geopolitical situation resulted in the loss by both Trieste and Fiume of their connection with their commercial backgrounds. Sušak, the port neighbor of Fiume, be-

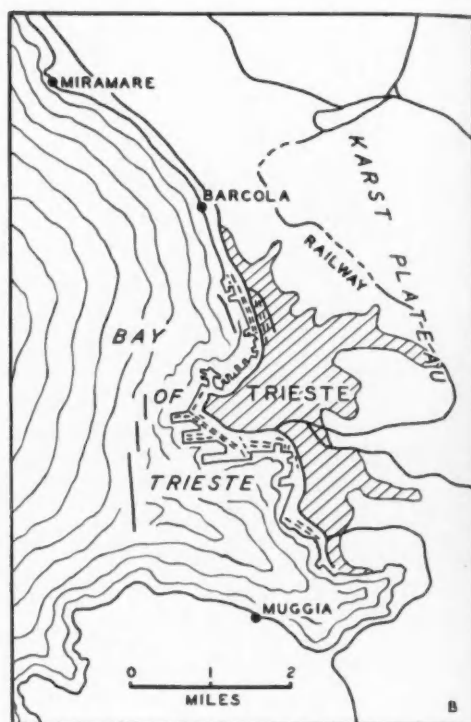


FIGURE 7.—Trieste at the foot of the Karst plateau; Miramare; Barcola; and Muggia.

came the Adriatic harbor of Yugoslavia.

The new era of the changed post-war political situation inaugurated new types of harbor developments. The decline, clearly indicated by the accompanying diagrams, leads to new developments of all kinds, for while none of the cities have adequate commercial fields, there are two geographical reasons for a rather hasty development. The need for a balance of power in the Mediterranean between Italy, France, and Yugoslavia, the new neighbor on the other shore of the Adriatic Sea, imbued the premier of Italy, Benito Mussolini, with the idea of making supremacy of the Italian harbors on the Adriatic Sea part of his imperialistic policy. The Italian government inaugurated the construction of



FIGURE 8.—The new harbor at Trieste with its massive cranes and waterside warehouses.

an up-to-date and most remarkable style of harbors on a large scale and with most advanced technical methods. In any appraisal or criticism of this new harbor development, this policy must be kept in mind. The scale of all the harbors, that is, their capacity, is quite incommensurate with the present need, for they are much larger than their use warrants; they are built for the future!

THE PRESENT SITUATION

The situation of Venice harbor as already has been described is that of an island harbor behind a natural sandy wall (the *lido*). Most of the streets of Venice are waterways such as, for instance, the famous city canal (*canale grande*). Compared with the palmy days of the régime of the Doges, the present traffic is slight. Half the way to the shore in the southwest of the island group, a

small canal leads between parts of the *lido* to a small harbor opposite the famous Piazza (place) of Venice and then to the city harbor. Here have been built since the war many warehouses and new basins, all on that large scale characteristic of the new Adriatic harbors. Great refrigerating storage, and warehouses for rice, tobacco, salt, and phosphates, give a distinctive character to this harbor. Most important of all is the pitcoal harbor with its many cranes, coal reserves, coaling stations, and special coal trains to provide Italy with full equipment. It indicates what superb construction can be carried on even with such an unfavorable foundation of alluvial sediments and only shallow waterways.

But there was not enough space for development as the Italian government wished to carry on in Venice, and so the modern Porto di Marghera near Mestre was begun as a new harbor, the third in Venice. This new harbor is situated west of the railway trestle that since 1846 has connected the lowland with the islands for a distance of about 2.3 miles. It was a laborious work, 80,000 piles of larch had to be set into the soil to give ground for building this dam. Porto di Marghera with many basins has become the main harbor of Venice. There is a special petroleum basin with refineries for oil and a series of pipe-lines for different kinds of oil running directly either to the special railway cars or to the oil wharves. Most of the tonnage is import and only in recent years has export tonnage increased.

The idea in constructing this new harbor was to inaugurate special industries in the harbor area, such as a special glass factory for crystal win-

dow glasses, mostly for export; a factory for transforming old iron into ore briquets with high content of iron: a high central tension power house, and in the neighborhood an aluminum factory. The annual increase in tonnage of Italy's merchant marine is remarkable. Italy now ranks fifth among the nations in newly added tonnage, the United

itants, is a special type of fishery harbor the resort of the fishermen and sailors. Once upon a time, in the middle ages, Chioggia, the small city on the spot where the mainland meets the lido and the bay, was a rival of Venice. For many generations Chioggia has remained a sea-city, being now the most important fishing harbor of Italy.



FIGURE 9.—Part of the city harbor of Trieste, with some of the craft docking at its wharves.

States taking first place, followed by France, Japan, and Germany. Porto di Marghera needs much more tonnage, until Italy will have under her flag as many ships as possible. The whole oversea trade of Venice in 1929 amounted to 4.17 million NRT of imports, 4.13 million NRT of export, and a mean of import and export of 4.1 million NRT.

On the southern edge of the laguna Chioggia, a city of 30,000 inhab-

Twenty miles west of Trieste, Italy has given special attention to the development of the first dockyard and wharf of the country at Monfalcone, founded in 1907 and developed by the Austrian government. The rapid growth in the last ten years of this very up-to-date wharf resulted from this preparation by Austria. Merchant ships, and such warships as submarines, are here built for Italy and for many

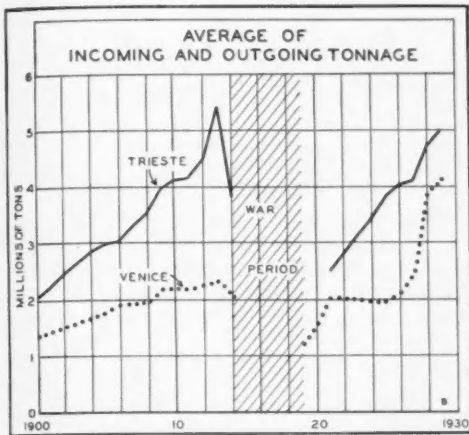


FIGURE 10.—A comparison of the port business of Trieste and Venice, before and after the World War.

nations, and not only for the countries of the Mediterranean.

Trieste, with about 250,000 inhabitants, has developed its harbors on a rather rocky, stony, and very small shoreline at the foot of the Karst plateau. This foremost, very important Austrian harbor on the Adriatic with warehouses, special harbor basins, and the biggest free harbor on the Adriatic, constituted a generous cession to Italy. Today the whole harbor system has capacity adequate for a very distant future, with brilliant prospects for a heavy increase in tonnage. One feature of these new harbors is the special warehouses for tobacco and other wares, situated in the free harbor, where goods may be selected for fabrication. Yet, Trieste is by no means a natural harbor. Three large

and long moles have been built parallel to the shoreline as breakwaters.

Fiume, the foremost Hungarian harbor, has not yet regained its pre-war tonnage, with 2.5 million NRT as a mean of incoming and outgoing ships of 1929 against 3.2 million NRT of 1912. The competition of Sušak, now the Yugoslavian harbor on the Adriatic Sea, is discouraging, Sušak being a first-class harbor for the surplus lumber of Yugoslavia.

A comparison of all Italian harbors on the Adriatic Sea demonstrates the important modernization of all harbors; but no doubt remains that the two harbors of Venice and Trieste measured in terms of tonnage are dominantly import. Their capacity is such as must be planned for world harbors, but in the achievement of these plans, many decades, even centuries, may be necessary.

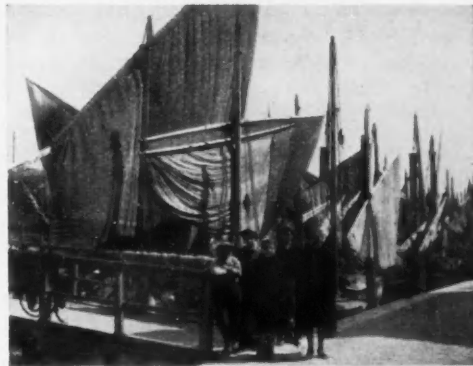


FIGURE 11.—Chioggia, the principal fishing port of Italy, with its fleet of seagoing fishing craft.

BOOK REVIEWS

UNITED STATES DEPARTMENT OF COMMERCE
BUREAU OF FOREIGN AND DOMESTIC COMMERCE

Industrial Traffic Management. A Survey of Its Relation to Business. By Wayne E. Butterbaugh. Domestic Commerce Series No. 39. Price, 30 cents.

Foreign Trade Survey of New England. (Manufactured Products.) By Charles E. Artman and Spencer H. Reed. Domestic Commerce Series No. 40. Price, 15 cents.

Of more than \$196,000,000 worth of goods exported from New England in 1928 by over 2,000 of its manufacturers, the most important classes of products were machinery and vehicles and other metal manufactures. Of individual products exported, however, leather ranked first. The survey shows, among other things, the significantly large part that the markets of Canada and Latin America play in the foreign trade of New England.

Confectionery Distribution in the United States, 1927-1929. By Rupert L. Purdon. Domestic Commerce Series No. 41. Price, 10 cents.

Motor Vehicle Regulations and Taxation in Foreign Countries. Trade Promotion Series No. 108. Price, 15 cents.

Radio Markets of the World, 1930. By Lawrence D. Batson. Trade Promotion Series No. 109. Price, 20 cents.

This study not only gives statistical data but includes the characteristics of the population, the laws governing the use of receiving sets, the physical characteristics of the various countries, and the present status of radio development in each.

The World's Exports of Coffee. By Mary L. Bynum. Trade Promotion Series No. 110. Price, 10 cents.

Industrial Machinery, 1930. By W. H. Rastall. Trade Promotion Series No. 111. Price, 15 cents.

It is believed that the business community as a whole can use statistics of the industrial-machinery industry as a barometer of general business conditions.

The Promotion of Tourist Travel by Foreign Countries. By Herbert M. Bratter. Trade Promotion Series No. 113. Price, 10 cents.

This bulletin was prepared in response to inquiries for information on foreign activities in the promotion of tourist traffic.

Commercial Survey of the Pacific Southwest. By C. R. Niklason. Domestic Commerce Series No. 37. Price, \$1.85.

This study attempts to analyze the major factors which affect the distribution of commodities within the Pacific Southwest. Basic activities, such as agriculture, forestry, mining, fisheries, manufactures, and recreational resources, have been studied as sources of income. Density and distribution of population, occupations, habits, and traditions of the area are studied in an attempt to evaluate their relation to the market for commodities. Distribution and transportation problems, the peculiarities of consumer demands and requirements, together with many similar subjects, have been studied. It contains a map of the United States showing contours, temperature maps of the Pacific Southwest, A. A. A. map of same area, together with a map of the National Park-to-Park Highway.

Distribution of Dry Goods in the Gulf Southwest. By Edward F. Gerish. Domestic Commerce Series No. 43. Price, 35 cents.

This study, the first of a series on the various phases of marketing in the Gulf Southwest, embracing seven States and constituting over 18 per cent of the total area of the United States, is divided into three distinct parts—wholesale distribution, retail distribution, and chain-store distribution, all relating to 1928.

The Coal Industry of the World, with special reference to International Trade in Coal. By H. M. Hoar. Trade Promotion Series No. 105. Price, \$1.00 (cloth).

This general survey of the coal industry of the world and its present position in international trade was undertaken with the aid to determining the factors that have culminated in its widespread depression during a series of years, and of placing in concrete form, before United States producers and consumers of coal, such statistical, technical, and general data as would aid in the adequate appraisal of the influences at work.

Motor Roads in Africa (Except Union of South Africa). By Irving Freidson. Trade Information Bulletin No. 733.

The countries of Africa present such a wide variety of climate and topography, and their economic resources cover such a wide range of raw materials, that each country presents its own peculiar problems as to the types of roads most needed. It is obvious that roads suitable for northern Africa and the desert areas would not be adequate for the countries of central Africa, where rainfall is heavy and there are vast forests with dense tropical undergrowth. This brief sur-

vey of highway construction and finance in the various countries and possessions of Africa does not include the Union of South Africa, as the road system of that part of the continent has already been analyzed in Trade Promotion Series No. 70.

Industrial Machinery Market in Siam. By Commercial Attaché Don C. Bliss. Trade Information Bulletin No. 738.

This bulletin discusses in detail the various sources of machinery demand, the volume and types of equipment now being absorbed, the opportunity for greater American participation in the market, the best methods of market approach, dealer selection, etc., all with the view to giving the United States exporter an adequate idea of the field for this equipment.

Banking System and Practices in France. By Thomas R. Wilson. Trade Information Bulletin No. 740.

Selling Automobiles in the Noncontiguous Territories of the United States. Trade Information Bulletin No. 741.

The Silver Market in 1930. By Herbert M. Bratter. Trade Information Bulletin No. 742.

Markets for Fruit Juices and Fruit Sirups in the United Kingdom. By James Somerville, Jr. Trade Information Bulletin No. 743.

Analyzing Statistics of Foreign Trade in Leather. (Importance of Shipper's Export Declaration.)

American Direct Investments in Foreign Countries. By Paul D. Dickens. Trade Information Bulletin No. 731.

Retail Credit Survey. January-June, 1930. Domestic Commerce Series No. 42.

Fresh Fruit Industry of Union of South Africa. Trade Information Bulletin No. 737.

Belgian-Luxembourg Iron and Steel Industry. Trade Information Bulletin No. 736.

Problems of Wholesale Dry Goods Distribution. Distribution Cost Studies No. 7.

International Trade in Leather. By J. Schnitzer. Trade Promotion Series No. 103. Price, 45 cents.

Leather Industry and Trade of Czechoslovakia. Trade Information Bulletin No. 732.

Monthly Summary of Foreign Commerce of United States, December, 1930. Parts I and II. Part I, Price, 10 cents; Part II, 5 cents.

Spain, Resources, Industries, Trade, and Public Finance. Trade Information Bulletin No. 739.

To American firms now exporting to Spain, and especially to those contemplating entering or developing that market, this bulletin should prove a valuable aid. The Geographic Section prepared the railroad map of Spain contained therein.

BUREAU OF MINES

Mineral Resources of the United States, 1929 (Preliminary Summary). Price, 20 cents.

Potash Bibliography to 1928 (Annotated). Bulletin No. 327. Price, 90 cents.

Bibliography of Investigations on Coal and Its Products, 1910-1930. Technical Paper 493. Price, 10 cents.

List of Publications, With Index by Subjects and Authors, 1910-1930.

BUREAU OF STANDARDS

Standards Yearbook 1931. Miscellaneous Publication No. 119. Price, \$1.00.

HELEN M. STRONG

CHAMBERLIN, R. T. and MCCLINTOCK, PAUL. *Chamberlin and Salisbury's College Geology. Part II—Historical Geology.* xxviii and 497 pp. Henry Holt and Company, New York, 1930.

It is not easy to revise a masterpiece. The younger Chamberlin and his associate, Paul McClintock, faced a difficult task when they undertook to bring up-to-date the volumes of their predecessors which had stood as standard for so many years. But later discoveries had been made in field and laboratory whose validity could neither be ignored nor denied; hence, revision became necessary. It was the price of progress. Instead of a patchwork revision, a new book was produced bearing the stamp of the original authors' genius, but made even more valuable by the addition of the later data into the scholarly pattern already existing.

The outstanding features of the new *College Geology* are the full treatment of the theories of the origin of the earth and the tremendous duration of geologic time. The various hypotheses are ably presented, the planetesimal hypothesis is well defended, various objections to it are analyzed, and a favorable verdict rendered. This should be expected, and the book gains by the frankness and the decisiveness of the discussion. Another strong feature of this volume is its ably written résumé of the Quaternary Period, particularly with respect to the character and extent of the glacial and fluvio-glacial deposits. Here the authors bring to a head the results of the work of many during the past two decades, dealing with the ages of the drift and loess sheets in the region south and west of the Great Lakes. It is true they take stands suggestive of finality in some cases where able workers are not in accord, but on the whole they state well the broader aspects of continental glaciation and loessal deposition in the interior of the United States. The economic significance of the deposits of the various ages is clearly brought out with emphasis on North American conditions, yet with rather full discussions of conditions on other continents.

Some will undoubtedly feel that the omission of bibliography is not warranted. Perhaps this was done because younger students rarely make any use of bibliographies published in their textbooks; nevertheless their presence is a continual reminder that the book is the result of the work of a host of scientists, and that the authors (all authors!) must lean heavily on their colleagues. In the judgment of the reviewer, the authors would have made their own cases stronger if they had been more generous in giving credit to those who have done the pioneering in the field of historical geography.

NELS A. BENGTSON

KELLER, A. G. *Starting-Points in Social Science*. 183 pp. Ginn and Company, Boston, 1927.

There is little that one need say of this book, by a professor of the science of society at Yale University. It is, as the title indicates, an introduction to the main factors in the development of the human race. A sentence in the preface states that "this collection of essays, dealing with elementary matters introductory to a study of the social sciences, was originally prepared and privately printed for intra-mural use in Yale University."

The author begins with a brief survey of the types of environment and the various races of mankind. Then, after chapters on the fact and the mode of adjustment, he continues with discussions of the ways in which man has adjusted himself to his physical surroundings and then to his social environment. The chapter headings under the section, "Human Adjustments," give a good idea of the content of the book. They are "The Fact of Adjustment," "The Mode of Adjustment," "The Food-Quest," "The Transformation of Materials," "The Appropriation of Forces," "Property and Property-Rights," "Exchanges," "War and Government," "Marriage and the Family," "Religion," "The Arts of Pleasure," "Science and Art," "Education."

PRISCILLA H. WEBSTER

ELSTON, ROY. *Off the Beaten Track in Southern France*. 320 pp.; map, appendix, bibliography, and index. National Travel Club, New York, 1929.

As the author tells us in his preface, these travel sketches are based on impromptu notes. He further states on page 105, "In wandering through these cities of France it is my custom to proceed without any definite plan, so that I come upon things unexpectedly, and therefore add the piquancy of surprise to the pleasure of seeing; so, also, one sees a great deal that one should not see, like quarrels and brawls, and the gawky paraphernalia of domestic squalor; but that is all in a merry day, and it is strange how the eye that has absorbed the subtle sweetness of plastic saints in aromatic churches will view composedly, a minute later, the contorted gestures of a sinner

in his cups." Mr. Elston is concerned with the accommodations found, the art and architecture observed, and the people encountered, during his peregrinations. He particularly enjoys the tales and legends associated with the places he visits and it is chiefly of such things that he writes, rather than of economic conditions.

There are some interesting descriptive passages; for example, on page 120, "The road from Avignon lies between vineyards and fields of maize. A tiny canal runs along the edge of it, irrigating the fields on either side, which are all extensively cultivated and divided by cypress or by cane palisades, which serve the purpose of an English hedge. It matters very little what the size of the field; however small, it will probably be held in by cypress trees, which bend away from the northwest, showing clearly the pressure of the mistral; and, if more evidence were needed of the bitter strength of that wind, you can see that on the mistral side of the trees the foliage is thin and blanched, while on the opposite side it is thick and green. Frequently the lower parts of the cypress stems are latticed with cane stalks as still further protection."

The reader who desires heterogeneous but intimate glimpses of places in southern France, rarely seen by the general tourist, should find this book an interesting addition to his library.

JULIA M. SHIPMAN

HUGHES, CHARLES EVANS. *Pan American Peace Plans*. 68 pp. Yale University Press, New Haven, 1929.

This ably and clearly written volume consists of lectures delivered in March, 1929, on the Sherrill Foundation at the School of Law, Yale University. It stresses the persistent efforts that statesmen have made to secure a multilateral treaty of obligatory arbitration. Such a treaty has now been successfully negotiated among the American states; Argentina is the only non-signatory. The book also indicates that the American states have provided for conciliation in relation to all disputes arising between them. This is a genuine step forward, since strife may break out at any time even in an unsuspected quarter and despite all declarations. In supporting this statement Mr. Hughes discusses the recent dispute between Bolivia and Paraguay over the Gran Chaco.

The most interesting statement to the reviewer was the following:

"It may seem to some a simple matter for nations to agree in the interest of peace to arbitrate disputes of every sort. Such critics have had little practical experience. As soon as you touch national interests, you meet conceptions of national rights which in the dominant opinion are to be safeguarded at all hazards."

While these lectures are of undoubted value to every one interested in international peace, they will be of greatest value to students of in-

ternational law and politics. They contain a dearth of geographic material.

LANGDON WHITE

The Economic Forces of the World. 3rd issue, revised. 176 pp., and 2 folded tables appended. The Dresdner Bank, Berlin, 1930.

The economists of the Dresdner Bank have rendered a valuable service to economic geographers in the publication of this brief volume dealing with the commodities and industries which figure most conspicuously in world economy.

The great value of the work lies in the comprehensiveness of its statistics covering not only the better-known products but also many of the newer, less well-known commodities and industries. Especially welcome are world statistics on air transportation and the cement, chemical, electrochemical, rayon, and automobile industries.

Statistics take up about 110 pages, including 97 full-page tables. For each commodity or industry, the authors have given production figures for 1928 and other years. They have also given data on the reserves, consumption, and international movement of some of the commodities. Wherever possible, statistics of physical volume have been reduced to tons, presumably metric tons. Values are expressed in reichmarks. Accompanying the tables are clear, brief analyses of the present trend and economic status of products and industries, either individually or by groups.

The compilation of world data from original sources and their reduction to common units appears to have been done with considerable care. Estimates or dubious statistics, included in a few instances because of the absence of reliable data, have been expressly designated as such. The conversion of figures into United States units (marks into dollars), though inconvenient, is of little moment when compared to the task of reducing data assembled from a wide variety of original sources.

Altogether, this unique little volume is a timely contribution from an authentic source. It should be in the library of every economic geographer.

MEREDITH F. BURRILL

MEARS, ELLIOT GRINNELL. *Greece Today*. ix and 336 pp.; colored map, ill.; preface, table of contents, chronology, bibliography, and index. Stanford University Press, California, 1929.

The theme of this interesting book may be found in a quotation at the beginning of Chapter VIII. "To Greece more than to any country of which we know, commerce has always been the foundation of national life, the very heart's blood of existence. Greece cannot live on agriculture, manufacturing or mining. Her economic function has always been from the first the bringing together of markets by her shipping; and her

place in the world has been determined by the success with which she has been able to carry out this function. Purely commercial conditions have controlled Greece even more than they have controlled Great Britain." Professor Mears, having been American Resident Trade Commissioner in Greece, elaborates this theme with a fullness based on his own observations and investigations, backed by access to reports and statistics.

Greece Today is much more than a compilation of trade statistics, for Professor Mears is a geographer and skillfully relates his facts to their geographic background. The inability of the country to produce for export little but luxuries, which in turn must pay for most of her imported necessities, is very vital to her economic life.

The subtitle of the book, *The Aftermath of the Refugee Impact*, indicates that the emphasis belongs on the second word in the title, which is indeed true. Any one who reads this excellent geographical study cannot help but have an increased interest in and an admiration for the new Greece which, having emerged from the havoc of war faces a bigger problem of peace; the temporary support and gradual assimilation of a million and a half refugees from Asia Minor. The very numbers, totaling more than one-fifth of the former population, seems overwhelming. The fact that a large proportion were women and children, absolutely without funds, greatly magnifies the economic difficulties.

For general readers more familiar with ancient Greece than modern, for the prospective tourist, as a case study in the field of economics, and for all geographers, *Greece Today* has genuine value.

JULIA SHIPMAN

PICK, W. H., B.Sc. *A Short Course in Elementary Meteorology*. 123 pp. His Majesty's Stationery Office, 1926; reprinted, 1927. Price, 1s. 6d.

This book has been written by a teacher for students and aviators and has the approval of the British Meteorological Office. It is divided into three parts:

Part I—*General Meteorology*—is a discussion of the climatic elements such as winds, temperature, and atmospheric moisture. This section also contains the international definitions and descriptions of the ten types of clouds.

Part II—Deals with the making of weather maps and the forecasting of weather.

Part III—Discusses the velocity, temperature, and pressure conditions in the upper air.

The author is very skillful in handling his material and wants this book to act as an incentive to solving many of the unsolved problems in meteorology. The best explanations which it is possible to give in the present state of knowledge have been given in the discussion. However, Mr. Pick is never dogmatic and wants the reader to feel that he should not be satisfied with any explanation or theory which the book offers.

Written as a text for elementary meteorology, the book adequately fulfills its purpose.

FRANKLIN C. ERICKSON

BRUNT, D. *Meteorology*. The Worlds Manuals No. 47. 112 pp., 19 ills. Oxford University Press, London, 1928. Price, 2s. 6d.

In the preface of his book, Brunt writes, "This book aims at giving a brief sketch of the physical principles underlying the phenomena which constitutes 'weather,' insofar as this is possible without mathematical analysis."

Chapter 1 in his book deals with the historical development of meteorology in order to impress upon the readers that the scientific treatment of the subject is of relatively recent growth.

Chapter 2 discusses the atmosphere and its physical properties and later in the book Mr. Brunt deals with the winds, pressure, solar radiation, temperature variations in the atmosphere, and cyclonic depressions.

Mr. Brunt has managed to give us in a very skillful way exactly what he intended to discuss. Throughout the entire book he has endeavored to deal with the various problems in as simple a manner as possible. The make-up of the book is attractive, and the book contains some fine illustrations of clouds and lightning flashes.

FRANKLIN C. ERICKSON

BROOKS, C. E. P. *The Weather; An Introduction to Climatology*. 78 pp. Benns Sixpenny Library No. 145. Ernest Benn, Ltd., London.

This book, though much smaller in size than Mr. Brunt's, contains much the same sort of material. Small as it is, it covers the subjects of winds, air conditions, cyclones, climatic zones, and climates of the continents. This book contains 78 pages and has two diagrams. It is written in a good clear style and has clear explanations. The material on which the book is printed is poor, but serves its purpose as a pocket edition on the introduction to climatology.

FRANKLIN C. ERICKSON

VAN CLEEF, EUGENE. *The Story of the Weather*. 274 pp. The Century Company, New York, 1929. \$2.50.

This is a story of the weather and its bearing on human affairs. The author writes that he has attempted to present a rather complex subject in a simple, straightforward manner.

In his simplicity, the author has omitted several words or phrases that are necessary to give the reader an adequate or true picture. The material in the book is written in an easy and readable style, but with the numerous incorrect or half true statements, beginning students of meteorology should read it with care. Being a recent publication, we should expect the book to contain up-to-date material. However, it lacks a discussion of warm and cold fronts.

The last few chapters, devoted to the bearing

of weather on human affairs, is probably the best part of the entire book. The illustrations are well chosen and the book proves to be entertaining reading.

FRANKLIN C. ERICKSON

CREUTZBURG, NIKOLAUS. *Kultur im Spiegel der Landschaft: Das Bild der Erde in seiner Gestaltung durch den Menschen*. xvi and 218 pages. Illustrated. Size, 10½ in. by 14½ in. Bibliographisches Institut Ag. Leipzig, 1930.

This book by Nikolaus Creutzburg contains a wonderful collection of pictures, showing the appearance of the earth and its modification by man. Each page contains on an average two large pictures, most of which are airplane views. Although the text that accompanies each picture is in German, and hence is a closed book to many, the pictures all have such great geographic quality that they tell their story in any language. There is one definite advantage in using such a book, and that is, that the non-German reading student will really see what is in the picture, without being told about it by the author.

EDWIN J. FOSCUE

Map of the Active Sugar Plantations of the Island of Cuba. Compiled by Munson Steamship Lines, and distributed by the National Sugar Refining Co., of New Jersey. Published by The Cuba Review, 67 Wall Street, New York, 1930.

This is an excellent map of the island showing, in addition to the active sugar plantations, the following: tobacco, henequen, pineapple, citrus fruit, grazing land, mountain land, swamps, and coffee. The major towns, the railroads, and the new Central Highway are also shown. The scale of the map, unfortunately, is not given, but it is about twenty miles to the inch.

EDWIN J. FOSCUE

JOHNSON, MARTIN. *Lion. African Adventure with the King of Beasts*. 281 pages. Illustrations and map. G. P. Putnam's Sons, New York, 1929.

Mr. Johnson's second book on the art of photographing the inhabitants of Africa is focused almost entirely on what its title proclaims. While *Safari* served as an introduction to many of the animals on the continent, *Lion*, except for a short visit to the pigmies in the Belgian Congo, concerns only his acquaintance with the chief of them. The author is a glorious adventurer, who knows how to tell his story so as to thrill the man in the easy-chair. His photographs prove him an artist as well, and he is generous with them.

Mr. and Mrs. Johnson spent four moons on the Serengeti Plains southeast of Lake Victoria. During that time, they lived practically in a lion cage five hundred miles square. They came to know the lion as few people would have the nerve

to do—not just a lion here and there, a chance encounter, an occasional hunt; but “lions all day, every day; lions all night, every night; lion fights and charges and encounters until our world became a world of lions.” They watched the lion at his hunting and killing, his courting, and his sleeping. They went to his home and watched his play with his family and friends and relations. They caught him in all his moods: serious, angry, curious, ridiculous. They came within five feet of him—and came away again.

The anecdotes are delightfully told with the touch of understanding which makes the lion almost human. And, at the end, is a bit of advice on cameras.

PRISCILLA H. WEBSTER

REICHWEIN, ADOLF. *Mexiko Erwacht (Mexico Awakens)*. 274 pages. Index and tables. Bibliographisches Institut Ag., Leipzig, 1930.

This unique study of Mexico—yesterday, today, and tomorrow—is originally intended for European use, but it is of great interest to the “Usamerican” if for no other reason than that he must know how the thinking European visualizes the relation between this country and Mexico. But apart from that rather indirect interest, the book also is valuable as an exceedingly clear, thoughtful, and readable account of Mexican developments traced to their historical foundations and followed through to the present day.

The author, who is known to some of us by his “Die Rohstoffwirtschaft der Erde,” justifies his study of Mexico by reminding Europeans that the Great War has meant the end of European hegemony in world affairs. If the old continent is to play her part in the new constellation, she must watch carefully and intelligently the way in which the other continents are faring without her guidance either as independent units of world economy or as parts of new alignments.

Mexico is here studied not so much for the sake of introducing the reader into Mexican social geography and history, but rather because Mexico represents a type, or perhaps it would be better to say a combination of several types, and serves to illustrate an important movement in the modern world. For, in the Mexico of today, a number of developments characteristic of the present stage of world history are occurring simultaneously. Mexico is wrestling with the problem of adjusting a feudal system to the new mechanic age. The awakening of the social conscience of the leaders and of national consciousness of the masses lays upon the shoulders of Mexican statesmen tasks of great delicacy and magnitude. Mexico tries to prove that the Indian race is capable of both civilization and culture. Finally, Mexico, perhaps more than any other country, represents the conflict between “rising nationalism and vested rights,” meaning, largely, the vested rights of foreign capital.

Mexico, as an object of foreign imperialistic and capitalistic designs, is in an exceedingly precarious position. Apart from the problems which this phenomenon always involves, the conflict between British and North American capital plays into the Mexican problem. Moreover, the one-sided and premature development of certain Mexican resources, brought on by the Diaz régime, may have counterparts in other countries, but it is probably unparalleled in the acuteness of problems which have sprung up in its train.

Professor Reichwein is a sociologist, but, as such, he is almost in a class by himself; for he combines with his sociological training a remarkable knowledge of geography, history, politics, and economics, and possesses, into the bargain, a rare ability to make a most readable story out of highly scientific accounts of very complex relationships.

While the book reveals a human sympathy for the social problems involved, it is remarkably free from anti-capitalistic or anti-imperialistic prejudices. It takes into account the fact of Mexico's precarious position inside of the strategic “field of force” of “El Coloso del Norte” just as much as the fact that Spanish feudalism and the concession policy of Diaz have brought about intolerable conditions for the large masses of Mexico's population. The task of the true statesman is to work out a new program which renders possible the satisfaction of just claims which spring from either one of these two elementary fact complexes. The author believes that the new spirit which is personified in people like Ortiz Rubio and Dwight Morrow warrants a high degree of optimism as regards the future peaceful relation between the two neighbors.

In its 250 pages, the book offers a fascinating account of Mexican resources, economic, political, and social history, and furnishes a readable introduction to all important problems which beset Mexico today. The author has not only travelled extensively in Mexico, but has also made full and intelligent use of a wide range of literature in German, French, English, and Spanish. The appendix contains a number of statistical tables which contribute to the practical value of the book whose chief merit, however, lies not in description and factual information, but in interpretation.

ERICH W. ZIMMERMANN

VAN HISE, CHARLES R., and HAVEMEYER, LOOMIS. *Conservation of Our Natural Resources*. New Edition. xvii and 551 pages. Size 5½ in. by 7½ in. The Macmillan Company, New York, 1930. Price, \$4.00.

The geographer, who has used Van Hise's *The Conservation of Natural Resources of the United States*, originally published in 1910, and reprinted six times between 1921 and 1927, will welcome a completely revised, new edition of this work under the shortened title of *Conserva-*

tion of Our Natural Resources. The old book of 413 pages has been expanded to a new volume of 551 pages, and all of the data has been checked and brought up to date. In spite of this complete revision, the outline of the original book has been retained throughout, except for the addition of a chapter (Part V) on "Wild Life."

Loomis Havemeyer, as editor of this new edition, has done a worthy piece of work in its revision. In his preface to the book he states that it would be impossible for any one person to be well enough versed on the different topics of the book to revise it in 1930, and for that reason he has had each part revised by a specialist in that particular field. Van Hise was able to write such a book in 1910, because of the great wealth of data made available by the report of the National Conservation Commission following the Conference of Governors, called by President Roosevelt in 1908. However, no such complete inventory has been taken of our resources since that time, and it was only by having someone, familiar with the recent developments in each field, to revise each part, that this new edition was made possible.

Following the introductory section of the book by Havemeyer, there follow six sections revised and written by seven authors.

Part I, "The Mineral Resources, by Gar A. Roush, Editor of "Mineral Industry," deals with the formation, supply, industrial development, reserve supply, wastes and losses in mining and utilization, and with the regulatory laws in regard to the major minerals such as coal, petroleum, natural gas, iron, copper, lead, zinc, gold, silver, aluminum, and the non-metallic minerals.

Part II, "Water," by Frederick H. Newell, formerly director of the U. S. Reclamation Service, discusses such problems as flood control, and the uses of the run-off for (1) water supply, (2) transportation of sewage, (3) irrigation, (4) water power, (5) recreation, and (6) navigation; and the various conservation problems connected with each.

Part III, "Forests," by Henry S. Graves, Dean of the Yale Forestry School, and formerly chief of the U. S. Forestry Service, deals with the problems of the rapid depletion of the virgin forests of the country, and the efforts that are being made by State and Federal Government to restore in part the former great resources of timber. Various agencies which tend to destroy the forests, including fires, are described, and remedies for checking their devastating power suggested. The wastefulness of the lumbering

industry is described, and finally a forest policy for the country is suggested which includes the following features: (1) public forests, (2) fire protection, (3) restoration of devastated lands, (4) forest taxation, (5) extension work in forestry, (6) research and experiment, (7) forest education, and (8) regulatory legislation.

Part IV, "The Land," by George S. Wehrwein, Professor of Economics, College of Agriculture, University of Wisconsin, discusses this very interesting problem under the headings of soil types, soil erosion and its prevention, present and potential uses of our land resources, reclamation of wet lands, crop yields, and land policies in regard to the disposition of the public domain. To the geographer, and particularly the student of land utilization, this one chapter is almost worth the price of the book.

Part V, "Wild Life," by Paul G. Redington, Chief of the Biological Survey of the U. S. Department of Agriculture, and Elmer Higgins, of the Bureau of Fisheries, U. S. Department of Commerce, is a worthy addition to the original volume. In this part of the book the authors discuss the various agencies and protective associations that have been organized by the States and by the Federal Government for the conservation of the wild life of the nation. These agencies not only tend to regulate the taking of wild life, but also control and regulate the habitat of this wild life, through the establishment of game refuges and sanctuaries. Similar topics are discussed in regard to fish life.

Part VI, "Conservation and Mankind," by Loomis Havemeyer, the editor, is almost an exact copy of a similar chapter in the original book, and is obviously a bit disappointing as a concluding chapter for a revised book. Nevertheless, the topics covered in this chapter are food for thought.

The book is profusely illustrated with maps and pictures, most of which are new. One cannot help wondering, however, why certain pictures were not brought up to date, as Figure 32A, page 147. Surely, the editor and publishers could have secured a modern picture of the Elephant Butte dam, which was completed more than fifteen years ago. In some few cases the pictures are not as clear as those in the original volume.

All in all the new edition of this book is an excellent piece of work, and the editor and publishers are to be congratulated upon it. *Conservation of Our Natural Resources* is a volume which every geographer should have on his reference shelf.

EDWIN J. FOSCUÉ

ANNOUNCEMENT

THE series on the *Agricultural Regions of the World* is resumed in this issue with another instalment of *Agricultural Regions of North America* by Dr. O. E. Baker. It is expected that the first instalment of *Agricultural Regions of Asia* by Dr. Samuel Van Valkenburg of the College of the City of Detroit will begin in the July, 1931, issue. This will be followed in a later issue by *Agricultural Regions of Africa* by Homer L. Shantz, President of the University of Arizona, and will complete the finest geographic discussion of the world's agriculture thus far published.

To obtain the complete series of these extremely valuable articles, which present for the first time on such a comprehensive and accurate basis the significant divisions of the world's most important industry, it will be necessary to subscribe at once for ECONOMIC GEOGRAPHY, and date back to the October, 1926, issue.

In addition to this series of articles on agriculture, other series are being initiated; every issue will also contain four or five articles dealing with urban and regional geography, with problems of land utilization, with programs of development of resources, with commerce, with transportation, with health, and with the hundred and one other subjects that are of present geographic interest, all by the most competent and best informed authorities in their respective fields. ECONOMIC GEOGRAPHY is indispensable to the intelligent citizen.

The subscription price to all new subscribers in the United States and possessions is \$5.00 the year or \$9.50 for two years. To all foreign countries, \$5.50 the year or \$10.00 for two years.

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Only a limited number of the first issues of ECONOMIC GEOGRAPHY are available.

The January issue of Volume 7 contains the following articles:

The Mesilla Valley of New Mexico: A Study in Aridity and Irrigation, Edwin J. Foscue, Southern Methodist University.
Land Utilization in the Scablands of Eastern Washington, Otis W. Freeman, State Normal School, Cheney, Washington.
Geographic Regions of Sierra Leone, G. T. Renner, University of Washington.
The Indiana Oolitic Limestone Industry, Stephen S. Visser, Indiana University.
Peanuts: Prices, Production, and Foreign Trade Since the Civil War, Arthur G. Peterson, U. S. Bureau of Agricultural Economics.
The Gulf Port City Region of Texas, William T. Chambers, Stephen F. Austin State Teachers College.
Chicory: Michigan's Infant Monopoly Crop, Floyd A. Stilgenbauer, College of the City of Detroit.

The October issue of Volume 6 contains the following articles:

The Great Basin, J. F. Bogardus, Wharton School of Finance and Commerce.
The Sugar Industry of Mauritius, C. J. Robertson, Istituto Internazionale d'Agricoltura, Rome, Italy.
Agriculture and Commerce of Uganda, Earl C. Case, University of Cincinnati.
Lower Rio Grande Valley of Texas, William T. Chambers, Stephen F. Austin State Teachers College.
Land Utilization in the St. Francis Basin, Sam T. Bratton, University of Missouri.
The Lime Industry at Rockland, Maine, Grant E. Finch, State Normal School, Danbury, Connecticut, and George F. Howe, State Normal School, New Britain, Connecticut.
Mountain Tops and Lowlands of Colombia, Albert C. Smith, New York Botanical Gardens.
Glacial Topography and Agriculture in Central Massachusetts, Berton R. Millington, Brown University.

July includes:

Agricultural Regions of Australia, Griffith Taylor, University of Chicago.
The Pastoral and Agricultural Industries of Kenya Colony and Protectorate, Earl C. Case, University of Cincinnati.
Economic Adjustments in Bavaria, Hubert A. Bauer, University of Washington.
Agricultural Regions of North America, Oliver E. Baker, U. S. Dept. of Agriculture.
The Forest of Dean in Gloucestershire, E. Muriel Poggi, University of Illinois.

April includes:

Agricultural Regions of Australia, Griffith Taylor, University of Chicago.
Cane-Sugar Production in the British Empire, C. J. Robertson, St. Mary's Training College, Middlesex, England.
Rainfall and Wind Conditions Retarding Tropical Development, Stephen S. Visser, Indiana University.
Agricultural Regions of North America, Oliver E. Baker, U. S. Dept. of Agriculture.
Land Values in the Blue Grass and Nashville Basins, Raymond E. Murphy, University of Wisconsin.

January includes:

Agricultural Regions of South America, Clarence F. Jones, Clark University.
The Potato Industry in Nebraska, Esther S. Anderson, University of Nebraska.
Agriculture in the Dry Region of the U. S. S. R., N. M. Tulaikov, Agricultural Experiment Station, Saratov.
The German Sugar Beet Industry, E. Muriel Poggi, University of Illinois.
Divisions of the Pine Forest Belt of East Texas, William T. Chambers, Stephen F. Austin State Teachers College.

The October issue of Volume 5 contains the following articles:

Geography's Part in the Plant Cost of Iron and Steel Production at Pittsburgh, Chicago, and Birmingham, Langdon White, Randolph-Macon Woman's College.
Readjustments in Post-War Cotton Culture, Earl C. Case, University of Cincinnati.
Tung Oil: Florida's Infant Industry, M. Ogden Phillips, Formerly University of Florida.
The Farm Problem, Robert Stewart, University of Nevada.
Forest Regeneration in Porto Rico, William D. Durland, Formerly University of Porto Rico.
The Topographic Map of the United States, Guy Elliott Mitchell, U. S. Geological Survey.
Agricultural Regions of South America, Clarence F. Jones, Clark University.

Single copies of back numbers of Volumes 1, 2 and 3, 1925, 1926, and 1927, will be sent to any American address for \$1.75 each; to any foreign address for \$2.00. Back numbers of Volume 4, 1928, Volume 5, 1929, and Volume 6, 1930, will be sent to any American address for \$1.50 each; to any foreign address for \$1.75. Whole volumes may be obtained at the yearly rate.

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